Mining Management Plan 2013 – 2017

Vista Gold Australia Pty Ltd

Mount Todd Gold Project

6 Water Management Plan

6.1 Introduction

Water management has historically been a challenge for the site since operations ceased in 2000. The site contains several ponds with lower than ambient pH and contains dissolved metals which include the Batman Pit (RP3), the waste rock dump repository (RP1), the tailings dam (RP7), the heap leach facility (HLP), and the low grade ore dump pump sump (RP2). AMD is generated each year during the wet season from precipitation on the Wast Rock Dump (exposed sulphidic rock).

The challenge over the years has largely been to prevent uncontrolled release of mine affected water entering the receiving environment using the existing water management infrastructure. Since Vista Gold undertook to manage the site, on behalf of the NT Government, in 2007 the water management strategy has been a combined effort of licenced water release, onsite storage and treatment. All activities have and are the subject of DME approvals. This strategy has successfully minimised uncontrolled discharges but has resulted in the net accumulation of AMD waters onsite to a level nearing capacity.

6.2 Surface Water

6.2.1 Surface water management infrastructure / features

6.2.1.1 Surface water catchments and drainage channels

The Mount Todd mine site is dissected by several ephemeral streams that are tributaries to the Edith River. Situated within the Daly River Catchment the site is part of one of the largest river systems in the Northern Territory with a catchment area of 52,577km^2. The site is situated to the north of the Edith River, drainage across the site flows primarily to the south via five ephemeral creeks; Batman creek, Horseshoe creek, Stow creek, Burrell Creek and West Creek. Burrell, West and Stow creeks discharge directly into the Edith River, with Horseshoe and Batman creeks reporting to Stow Creek. Location the creeks and rivers are shown in Figure 11.

West Creek

West Creek receives clean water from the diversion channel on the western side of the site, from the spillway of RP1 and from natural runoff west of the site. West creek is dominated by freshwater flows, unless an uncontrolled release is occurring via the RP1 spillway.

Burrell Creek

The Burrell Creek catchment area is essentially covered by the Waste Rock Dump and RP1. The lower reaches of the creek receive small amounts of local freshwater runoff during rain events however the majority of any flows are typically due to licenced releases of water from RP1 via the siphon system.

Batman Creek

Batman Creek is fed by a natural catchment area up-stream and to the west of the site, but can also receive overflows from uncontaminated areas through the site and via RP2 and RP5 if they exceed capacity. As of 2013, Batman Creek will also be capable of receiving treated water from RP3 via pump and/or siphon. The majority of flows into Batman creek are from freshwater runoff. Horseshoe Creek

Horseshoe Creek is primarily fed by natural catchment flows which originate from the raw water supply reservoir, the diversion channel around the Tailings Storage Facility (RP7) and preceding catchments. Any excess water within RP7 would report to Horseshoe creek via the RP7 spillway. Small amounts of water enter the creek year round from seepage points around the southern and eastern walls of RP7. Water from the Heap Leach Pad (HLP) moat can enter the catchment if the northern or eastern moats become blocked by erosion of the HLP during rainfall.

Stow Creek

Stow Creek lies to the south of the site and is fed by Batman Creek, Horseshoe Creek and the dominant remainder of its natural catchment to the east of the mineral lease. No onsite infrastructure or activities result in direct discharge to Stow Creek, such waters can only be received via one of the previous catchments.

Edith River

The Edith River flows from east to west across the south of the site. The river intersects MLN 1127 and receives the runoff from all the previous site related catchments. The volume of runoff from site related catchments typically contributes less than 50% of the total flow within the Edith River at any time. The river has a high ecological and recreational value with the site located approximately 9km downstream of Edith Falls situated within Nitmiluk national park.

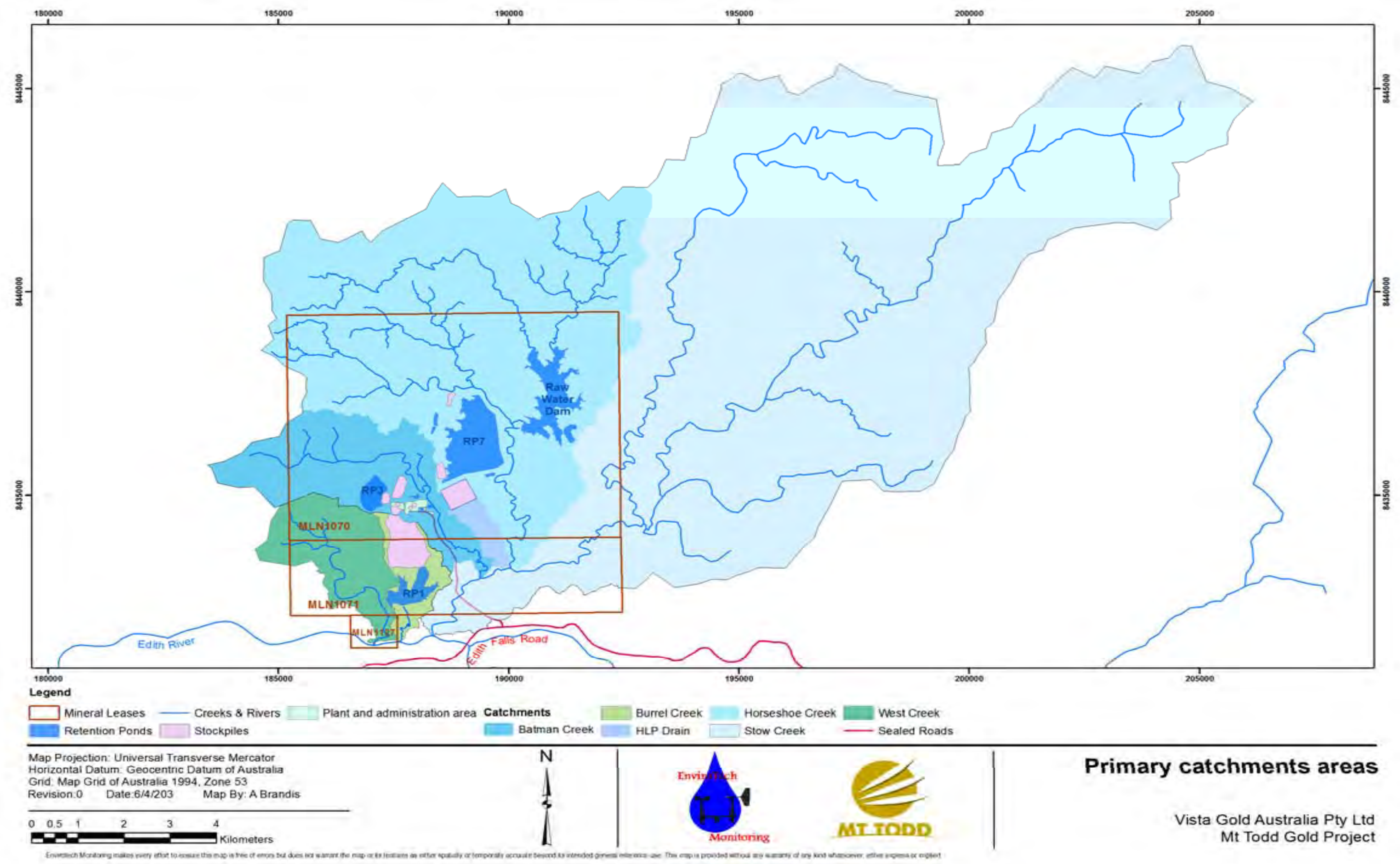


Figure 11 - Onsite catchments, creeks and rivers

6.2.1.2 Diversion drains

Four diversion drains currently exist at the site as shown in Figure 12. Three reduce the volumes of clean water entering onsite catchments and one prevents AMD from directly flowing into natural streams. Details of the diversion drains are as follows:

- Western Waste Rock Dump diversion drain – This drain was constructed during previous operations and is situated to the west of the Waste Rock Dump and RP1. The drain channels flow from the upper reaches of Burrell Creek away from the WRD and RP1 into West Creek
- RP1 Diversion Drain – This drain was commissioned by the NT DME and constructed in late 2011. The drain is situated to the west of the RP1 and collects runoff from the natural surface that lies between the Western Waste Rock Dump diversion drain and RP1. This clean water is diverted away from RP1 and into West Creek.
- Low Grade Ore Stockpile Diversion Drain – This drain was constructed during previous operations and is situated adjacent to the eastern side of the Low Grade Ore (LGO) Stockpile. The drain captures runoff from the stockpile and channels it into RP2.
- Also commissioned by the DME and constructed in 2011 is the Northwest TSF diversion drain which captures runoff from the western catchment as well as overflow from Golf and Tollis pits and diverts this water to Horseshoe Creek away from RP7.

6.2.1.3 Onsite catchments

Internal drainage at the site comprises six primary catchments as listed in Table 14 and shown in Figure 12. A number of smaller ponds without catchments are located onsite but these do not require active management and are therefore not considered in water management operations or planning.

Table 14- Onsite Catchment areas

Catchment	Area (Km^2)
RP1	2.174
RP3	0.617
RP5	0.346
RP2	0.323
HLP	0.347
RP7	2.358
TOTAL	**6.16**

The catchments areas listed in Table 14 and Figure 12 have been derived from the DME 2008 DEM and corrected where necessary based on local knowledge of surface water flow paths. Catchment areas listed include the respective surface areas of the ponds.

The RP1 catchment stretches to the north and encompasses the WRD. 42% of the RP1 catchment is overlain by the WRD with the remaining 58% contributing to freshwater inflows either via non WRD runoff or direct precipitation onto the pond. The construction of the RP1 diversion drain in 2011 resulted in a 7.71% reduction of the RP1 catchment area from 2.356 km^2 to 2.174 km^2. A second diversion drain had been proposed for the eastern side of the RP1 catchment by the DME, however 2011 works were abandoned due to the significant shelf rock present and the associated additional cost. The northern extent of the RP1 catchment does not contain the surface runoff from the WRD. This runoff generally flows north into the RP5 catchment during heavier falls.

Due to infrastructure between the Run of Mine (ROM) pad and RP3, surface water from the ROM report to RP2 instead of RP3. The majority of other runoff into RP3 is considered freshwater with little additional AMD being generated by the pit walls due to their current submersion and lack of exposure to air for oxidation.

A small drain exists on the western face of the RP2 LGO stockpiles which collects runoff from the western face of the stockpile and transfers it into the main RP2 diversion drain. The RP2 catchment is technically limited to the extent as shown in Figure 12 however during heavy downpours, runoff from the opposite side of the road to the west can occasionally breach the road camber and enter this drain and subsequently RP2.

The HLP moat does not receive any inflows external to the lined facility. All moat inflows are restricted to direct incident rainfall or HLP runoff.

The RP5 catchment largely encompass the old mine processing and current operational facilities, however the catchment does encompass the southern faces of the ROM pad and well as surface runoff from the access ramps and roads on the WRD.

The RP7 catchment is dominated by the existing pond. 72.5% of incident rainfall falls directly within the storages maximum surface area. The 2011 constructed diversion drain resulted in a 13.5% reduction of the old catchment area from 2.727km^2 to 2.358km^2. The majority of natural inflows are freshwater with a small amount of AMD generated by the scats stockpile to the west.

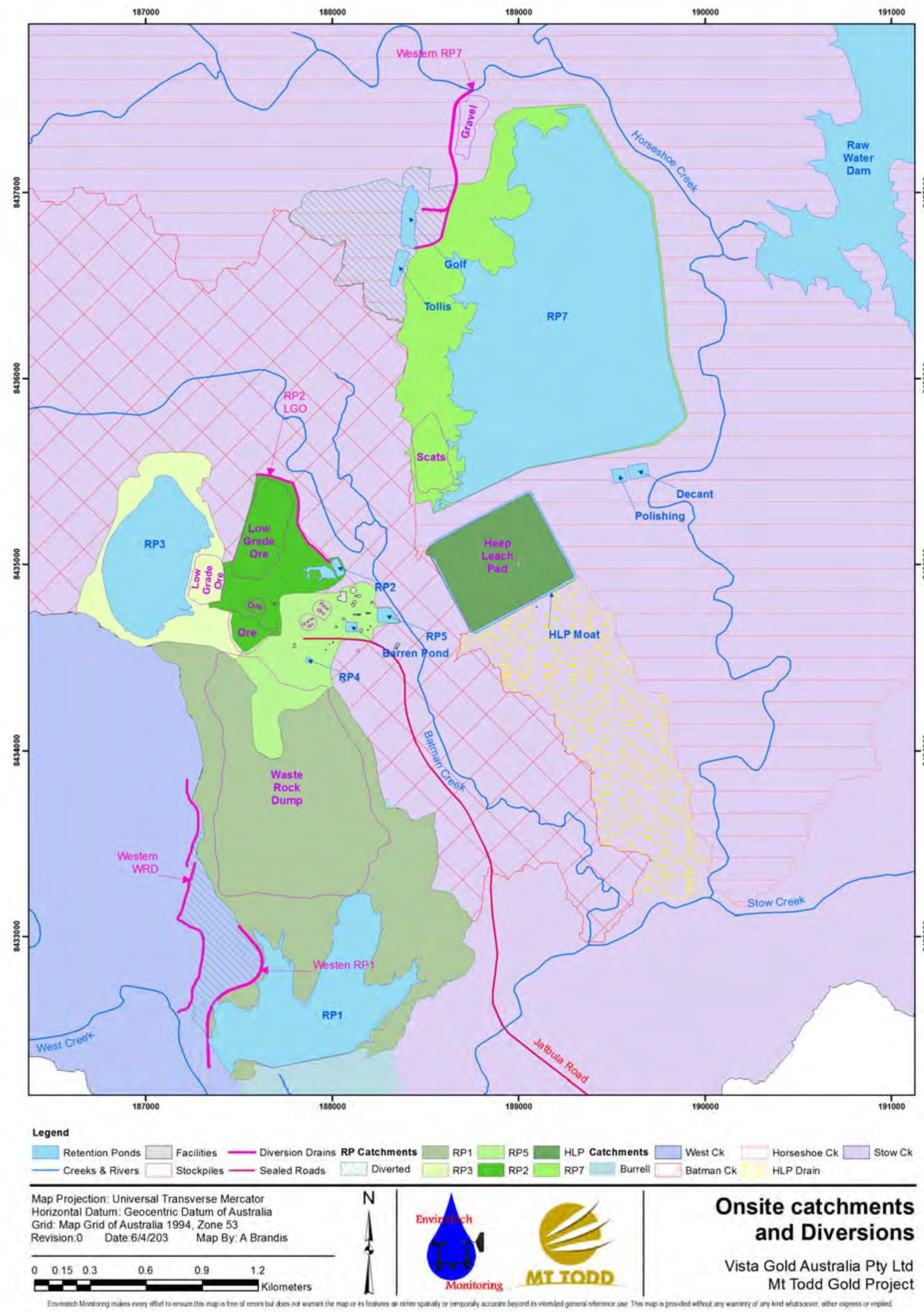


Figure 12 - Onsite catchments, ponds and diversion drains

6.2.1.4 Retention ponds

The six primary retention ponds onsite considered when planning water management activities are listed in Table 15. A number of other ponds exist across the site however all contain fresh water and as a result do not currently require active management for environmental, safety or engineering purposes. The locations of the primary and secondary ponds across the site are show in Figure 12.

Table 15 - Primary site retention ponds

Storage Structure	Retention Pond Number	Maximum Storage Capacity (ML)*	Surface area at capacity (m^2)	Spillway Height (AHD)	Spillway Coordinates (WGS84)
Waste Rock Dump Retention Pond	RP1	1,255	357,536	120.26	187440E 8432275S
Low Grade Ore Stockpile Sump Pump	RP2	11	3,885	130.37	188016E 8435032S
Batman Pit	RP3	11,810	323,323	143.5*	187299E 8434769S
Plant Run-off Sediment Trap	RP5	Maximum: 18.7 Current: 12.5$^{\beta}$	7,175	129.13	188330E 8434739S
Tailings Storage Facility	RP7	5,070	1,544,829	137.48 (Plug Crest)	188519E 8435350S
Heap Leach Pad Moat	HLP	12^	22,966	135.15*	188981E 8434742S

*Notes: * These structures do not have engineered spillways and levels reported are elevations of equivalent breach points*
^Exact volumes are unknown due to varying yearly siltation quantities
$^{\beta}$Reduced volume due to silt

RP1

This storage was constructed during previous operations for water supply and WRD runoff containment and is situated in the Burrell Creek catchment. Currently the ponds only role is AMD containment. The pond is an unlined facility with a clay and earthen wall. Little information is available on its engineering specifics or the extent of any specific works to minimise seepage into local groundwater. The quality of water within the pond is and has been historically poor with high metal contents and low pH ranges. Seepage is evident on the downstream side of the wall all year as a result of the transmitted head pressure on the monitoring bores below the structure. The water quality of the seepage resembles a close signature to the retained waters and predominantly rises from the deeper bores.

The storage contains a 45m wide spillway on the south western corner which permits excess water to flow into West Creek. Prior to 2011 the spillway had a height of 119.37m and was primarily of earthen design with a shallow 30cm wide concrete core at the control point. In late 2011 the DME commissioned a lift to the storage wall and spillway to increase the storage capacity and minimise the frequency of uncontrolled discharges from the pond.

Vista have been unable to get any of the engineering details of this lift by the DME. As a product of this we are unable to determine if this complies with ANCOLD guidelines.

. The new spillway has a height of 120.26m and comprises a concrete core surrounded by earth and rock armouring with gravel capping. Modelling of the new storage height suggests the pond now has an additional storage of 377 ML, increasing the maximum pond storage level from 878 ML to 1255 ML. The modelled full capacity surface area is show in Figure 13

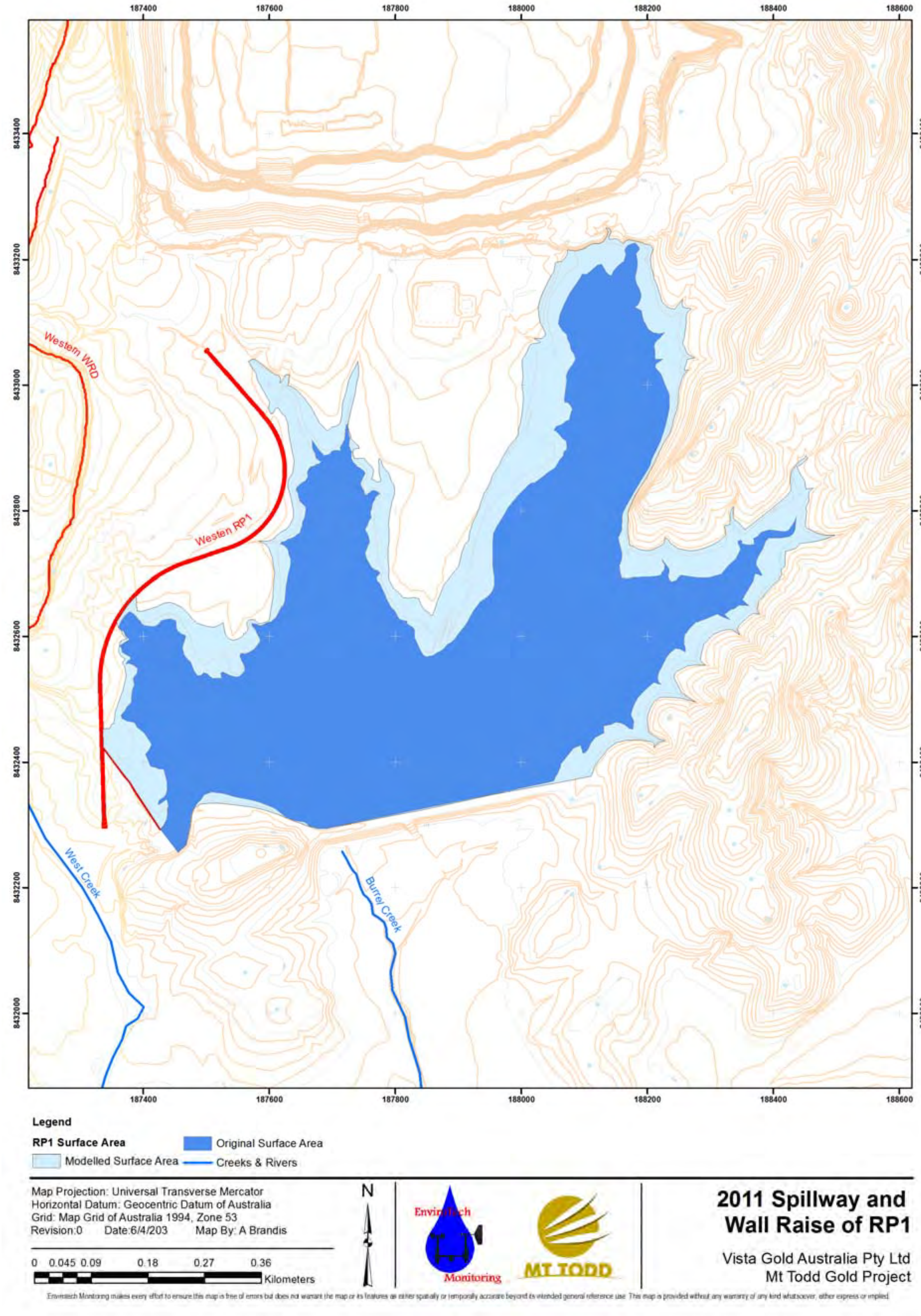


Figure 13 - Maximum surface areas of RP1 before and after spillway modifications

A scour valve was also installed beneath the wall to permit controlled release to the Edith River during operations however the valve has since failed and has been permanently sealed. A 500mm poly siphon was subsequently installed over the dam wall during NT government operation of the site prior to 2007 and has since been used for all licenced control discharging activities. In 2010 an inline magnetic flow meter was installed by Vista Gold to the 500mm siphon system to permit accurate measurement of controlled releases. A further two 400mm siphons were installed in 2012 over the RP1 wall under direction from the NT government as a further countermeasure to uncontrolled releases. Allowable dilution rates within Waste Discharge Licence 178-3 are such that only one siphon can ever be used at a time given the current pond water qualities.

RP5

The RP5 pond is a lined facility and was constructed during operations to trap sediment from the plant and processing area. It is located to the west of the processing area all of which is situated within in the Batman Creek catchment. Its current capacity is less than original design due to the significant quantity of sediment present. This volume of sediment was quantified in 2013 by onsite survey and is reflected in the numbers presented in Table 15. It is planned to remove the majority of the silt prior to the wet season. Water quality of the pond is generally poor likely due to the scattered ore stockpiles within the catchment. The pond lining integrity has not been verified by Vista, .Visually it shows no direct or indirect signs of damage, and there is also no evidence of near surface seepage during the dry season. The pond has a spillway situated on the eastern face and any discharged water will report directly to Batman Creek. Excess water will be pumped to RP7 directly. A backup electric pump is also available.

RP2

Situated immediately to the north of the old processing facilities, this pond’s primary purpose is to capture AMD runoff from the LGO stockpiles to allow pumping to alternative storage (RP3 or RP7). The pond was constructed during operations primarily by excavation into the ground and only has a small retention wall on the south eastern corner. The pond is unlined and no information is known as to the extent of groundwater seepage (other than visible seepage through the retention wall) or the specifics of its construction. It is planned to place a core plug through the retention wall prior to the 2013-14 wet season. The northern face contains the spillway which discharges excess water northward prior to entering Batman Creek. The lower end of the RP2 catchment terminates immediately to the west of RP2, this area pools with water from the catchment before flowing through a channel on the northwest corner of RP2 into RP2.The water can pool to a depth of approximately half a meter in certain locations and spread over an area in excess of 600m^2.

Water can be pumped from RP5 into RP2, although pumping from RP5 directly into RP7 is the preferred strategy

A permanent piping option allowing an ancillary pump exists and is utilised when additional pumping capacity is required.

RP3

The former Batman pit, is not a retention pond, and has historically been the final destination of waters pumped from other retention ponds in an effort to mitigate uncontrolled discharges from site since operations ceased in 2000. If the pit was to ever completely fill to the point of overflow, water would begin to discharge around the area of the access ramps, and such water would report to RP1 and then the Edith River. The water quality within RP3 has historically been poor, with low pH and high metal concentrations, however this has significantly changed during 2012-13 as outlined in section 6.2.3.1

At the lower levels there is some debate on if the is seepage or ingress into the pit void occurs. Some modelling suggests 0-30l/sec while others suggest the there is no connectivity.

It is recognised that there is a brecciated zone at the very surface that is predicted to allow connectivity. Due to this feature the operating strategy is to ensure the water levels in RP3 remain below this zone.

RP7

The former tailings impoundment facility is located in the Horseshoe Creek catchment. Significant engineering was undertaken during the construction of RP7 to effectively manage seepage. High permeability soils were removed from natural channels and replaced with low permeability soil blankets topped with a network of porous drains to form an effective seepage capture system. A network of decant towers was installed to facilitate the collection and reuse of supernatant as the tailings beaches grew along the retaining wall. Both piping networks transfer the water to the decant and polishing ponds below the southern wall, prior to the water being reused in the processing plant. Both the decant and underdrainage valves have largely remained closed (minor opening during servicing) since operations ceased. The net effect this has had on groundwater seepage rates is unknown.

The emergency spillway is located at the south western corner and is comprised of a canal formed into the siltstone which carries water around to the southern channel between RP7 and the HLP. Under direction from the DME in 2011 an earthen plug was installed in the spillway to stop uncontrolled overflow from the storage, Vista Gold did not support this action and has sought DME approval to remove it. The earthen plug has a current elevation of 137.48 which reduces the freeboard before overtopping the wall to approximately 300mm. A structural integrity inspection was commissioned by Vista Gold to assess the additional risks the plug would place on the wall. One of the recommendations of the report was to manually breach the plug if water levels within the structure reach the plug crest.

Water quality within RP7 is poor, primarily due to the storage acting as a receptacle for site AMD waters since operations ceased in 2000, and to a smaller extent, due to AMD runoff from the scats stockpile in the south western corner of the catchment. The supernatant water has a low pH and the highest dissolved metal content of all ponds even despite efforts to raise the pH through discharge of reactant from the Water Treatment Plant (WTP) in recent years. The tailings pore water still largely exhibits a process water signature and despite the acid neutralising capacity (ANC) having been exhausted in the top 1.2m, sufficient ANC remains below the acidic wedge.

As a result of its operation as a water storage, the high water levels within RP7 have had the benefit of minimising acidity generation from oxygen exposed unsaturated tailings. However the high water levels have also resulted in increased infiltration of low pH waters along the western side and as a result now flow along the old drainage lines and express as seepage below the structure wall. By volume the largest seepage occurs from RP7 where the structure crosses over the pre-existing creek lines. These seeps and a number of others present visibly at the surface. Seepage is also present within the groundwater as measured via the existing monitoring bores and exhibits a process water signature.

HLP

The heap leach facility was a purpose built and lined basin where ground oxide ore was stockpiled and cyanide irrigated for mineral recovery. The structure contains an estimated 214,000 m^3 of various small grain sized material which suffers from significant erosion during the wet season. A moat surrounds the leach pad and also sits within the lined basin which receives inflows either as direct runoff from, or seepage through, the leach heap. The moat has an estimated capacity of 12 ML, which fluctuates from year to year as eroded heap sediments fill and are subsequently excavated from the moat each year.

The moat has three pumps along the southern wall, however two have been disconnected and only the third is used to adequately maintain moat levels below capacity.

Continual excavation of siltation build up is necessary to ensure water can flow around to the pumps during the wet season. The structure has no engineered spillway, if the moat was to exceed capacity it would commence spilling approximately midway along the southern wall. Such water would then travel down the locally named HLP drain and into Stow Creek. However significant siltation can result in the blockage at any position along the moat which would see such overflow report to a different catchment depending on the location of the blockage. The Northern and eastern faces would report to Horseshoe Creek, the southern face to the HLP drain, and the western face to Batman Creek. Pipes and windrows atop the HLP capture and transfer water to the moat in an effort to minimise the erosion. The water quality within the moat is poor but comparatively better than other retention ponds onsite. A small surface seep is evident on the north eastern corner of the HLP but only when the moat is full. The complete integrity of the lining is unknown but likely to be compromised as evidenced by weathering in patches and poorer quality of chemical results from the adjacent monitoring bores.

6.2.1.5 Pipeline and valve infrastructure

The site is equipped with High-Density Polyethylene (HDPE) pipelines of various diameters that are used to transfer surface waters in efforts to minimise uncontrolled discharges from retention ponds. Variation in pipe diameters evident on many pipelines has resulted from the reuse and recycling of piping inherited when site management commenced.

Table 16 provides information on the source, destination and size of each pipeline and Figure 15 illustrates their relative paths and position across the site.

Table 16 - Pipeline Infrastructure

Start	End	Size (mm)	*Length (m)
RP1	WTP	315 – 355	3113
RWD	RWT	315 – 500	3512
RP5	RP7	200-500	1112
RP5	RP2	200	469
Polishing Pond	RP3	315	2104
HLP	WTP	315 – 355	1703
RP3	Batman Ck	500	999
RP2	WTP	280 – 355	439
RP2	RP7	200 – 500	1,120
WTP	RP7	315 – 355	1563
RP1 Line Junction	RP3	315 – 355	512
RP1	Burrell Ck	500	79
RP1	Burrell Ck	400	68
RP1	Burrell Ck	400	73

*Pipeline lengths recalculated in 2013

A permanent valve and flange has been connected into the Polishing Pond to RP3 line at RP2. This valve permits the connection of the mobile diesel pump if additional capacity or emergency pumping is needed at RP2.

In 2013 the RP5 to RP2 line was modified to redirect RP5 waters directly to RP7, rather than the historic approach of first transferring the waters to RP2.

In 2013 the RP2 line was modified to also redirect waters directly to RP7.

A number of valves and pipes have been installed around the WTP to enable the company to alter the destination of pumped waters. This plumbing network is illustrated in the figure below;

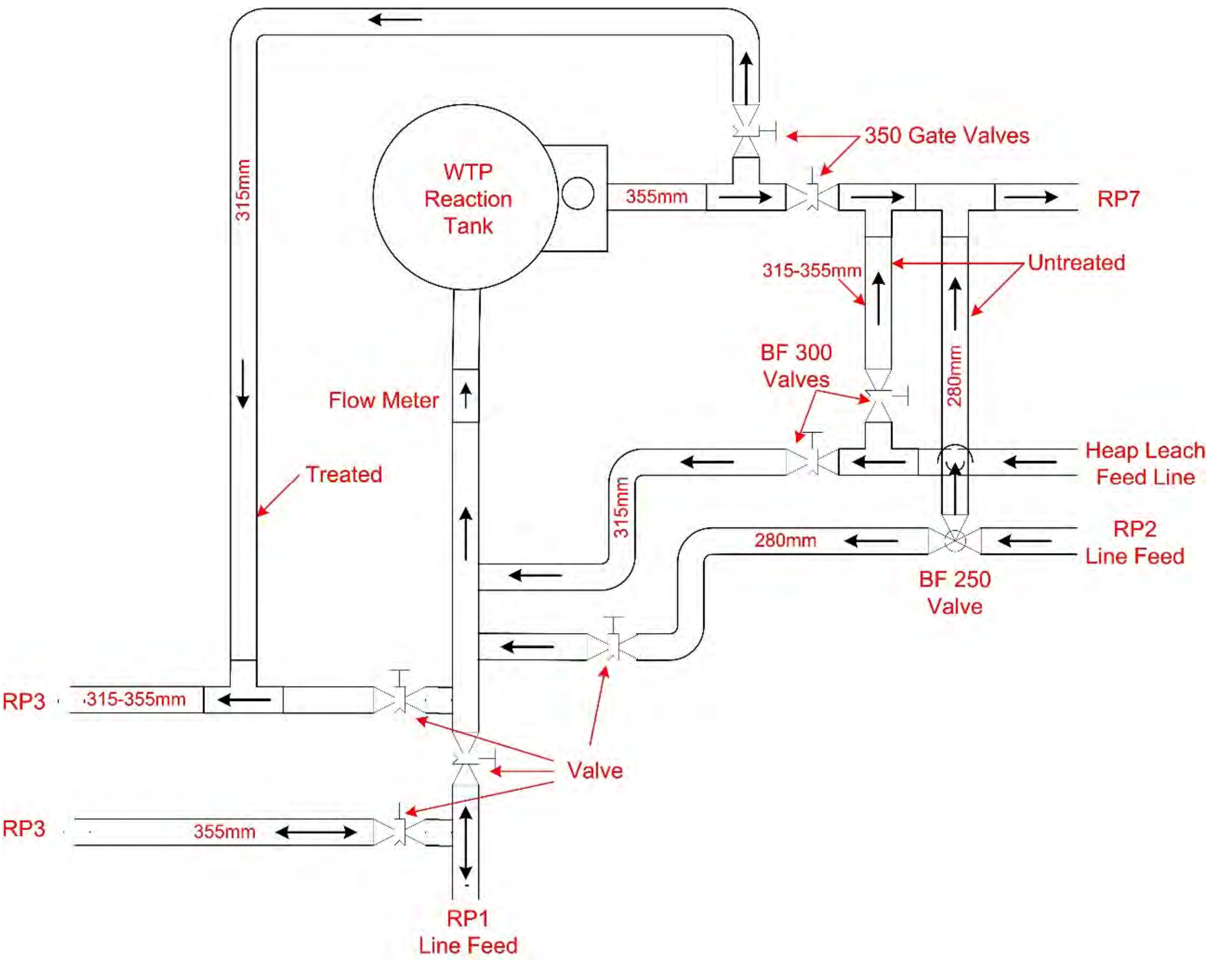


Figure 14 - Pipe and valve arrangement around the WTP

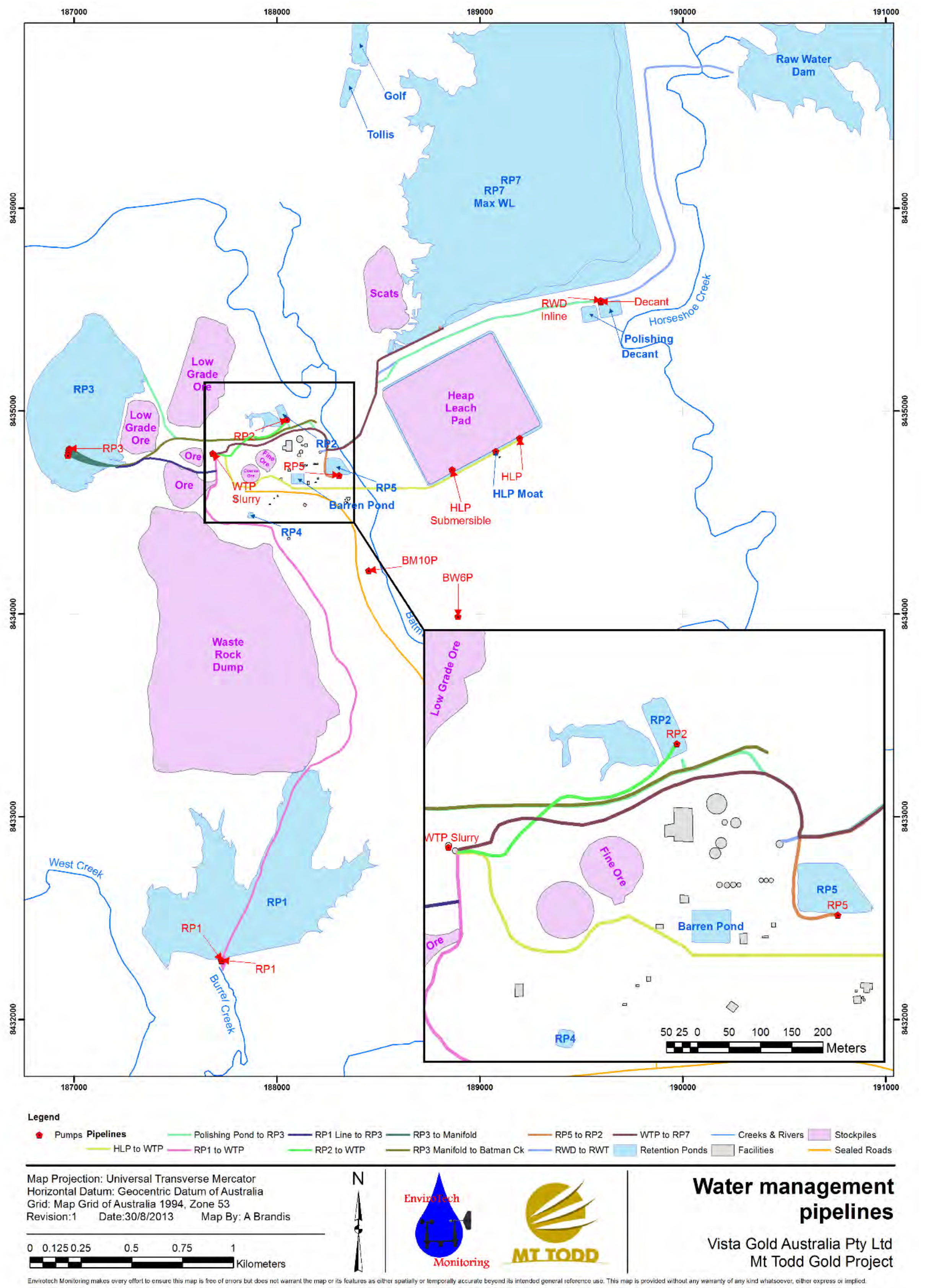


Figure 15 – Existing pipe and pumping Infrastructure

6.2.1.6 Pumps and siphons

The following table lists the pumps and siphons on the Mt. Todd mine site.

Table 17 - Pump infrastructure

Location	Quantity	Type	Size	Flow rate (L/s)
RP-1	2	Centrifugal	110kw	110
RP-2	1	Centrifugal	54 kw	80
RP-5	1	Centrifugal	15 kw	18
Heap Leach Pad Moat (disconnected)	2	Centrifugal	15 kw	18
Heap Leach Pad Moat	1	Submersible	37 kw	95
Bore #6	1	Submersible	2.2 kw	4.5
Bore #10 (unused)	1	Submersible	2.2 kw	4.5
Standby Diesel Pump	1	Centrifugal	425 kw	120
WTP (slurry pump)	1	Centrifugal	1.5 kw	3
Decant Pond	2	Centrifugal	150kw	125 ea.
RWD Line	1	Centrifugal	110kw	100 (estimate)
RP3	4	Centrifugal	500kw	100 to 1,000 (combined, variable output)
RP1	1	Siphon	500mm	100-240
RP1	2	Siphon	400mm	200 ea.

All of the above pumps are in good working condition and capable of coping with the average wet season demands of the site during non-exceptional rainfall conditions. An automated start/stop system has been installed which enables the remote control of most pumps from the site office via telemetry. Some manual control of the pumping systems will always be necessary as a number of the pumps fail to maintain their prime and must be checked prior to starting in order to protect the equipment.

While there are two pumps located at RP1, only one can be operated at a time due to limitations of the electricity transformer at RP1. The two centrifugal pumps at the HLP have also been disconnected due to the limited capacity of the transfer pipeline to receive water from more than one pump and the historical lack of demand for their use.

The standby diesel pump is mounted on a twin axle trailer which enables it to be transported to various locations for additional pumping requirements as necessary.

The flow rates specified for the RP1 siphons are approximate only as the actual flow output flow rates are dependent on the amount of hydraulic head within the pond. The 500mm siphon contains three valves on the downstream side which permits the regulation of output flow volumes.

We are also in the process of installing and testing a syphon line from RP3 to the RP1 discharge point, which could be used to lower RP3 approximately five to seven metres.

The four pumps listed at RP3 were installed during 2012-13 in preparation for dewatering of RP3. The pumping system consists of four 500 kW variable speed centrifugal pumps mounted on floating pontoons within RP3. Each pump is capable of outputting a range of flows from 100 to 250 L/s at a hydraulic head of up to 85m. Each pump line is connected to a manifold on the shore of RP3 which combines the individual lines prior to passing such water through a magnetic flow meter and then discharge into Batman Creek. Each pump is driven via a Variable Speed Drive (VSD) mounted on the shore. The variable speed and independent pump design permits the system to release water to Batman Creek at total flow rates from 100 L/s to 1,000 L/s. The actual flow rate permitted is calculated based on the available water in the Edith River, the permitted dilution rate from chemical composition and direct toxicity assessments (DTA), and as per relevant criteria of WDL 178-3.

While manual operation is possible, this RP3 pump operation and control process is designed to be entirely automated through telemetry, and only requires operator attention for routine servicing or correction of faults. The RP3 system requests the flow rate of the Edith River via telemetry from the SW4 gauge station at regular intervals. It then applies the operator set dilution ratio to calculate the volume of water which can be pumped. As soon as the calculated volume exceeds 100 L/s one of the four pumps starts and water at the correct flow rate is released to Batman Creek. As the Edith flow increases further, the RPM of the pump adjusts to match the volume increase, and additional pumps are spun to provide the additional flow input up the 1,000L/s maximum.

Pump status and flow rate information is logged continuously and presented as a live graphical dashboard on the company intranet. In the event the RP3 pumping system is not able to obtain the flow rates from the Edith River all pumping immediately ceases as a safety precaution.

6.2.1.7 Water treatment plant

The sites water treatment plant was commissioned in 2009 and is located atop the ROM pad. The plant consists primarily of a lime silo, slaking tank, reaction vessel and control system. The lime silo holds approximately 87 tonnes and provides finely ground limestone to the slaking tank where it is mixed with water to form a lime slurry. The slurry is then pumped into the reaction vessel where it mixes and reacts with incoming AMD water, to increase the pH to greater than RP3 at the time. The pH increase causes the dissolved metals in solution to form metal hydroxides and precipitate out of the solution. As per the piping schematic in Figure 14, AMD waters from a variety of sources can be pumped to the WTP for neutralisation. The resultant treated water and precipitates are then discharged via gravity to either RP7 or RP3. An automated control system monitors the pH of the reaction vessel and regulates the quantity of slaked lime delivered. The control system is also connected to the site telemetry network which enables onsite staff to view and control the system at the office.

Due to the limited flow rates of the plant, it can only accept waters from retention ponds at any one time in the following arrangement –

- RP1 only
- RP2 only
- HLP only
- HLP with RP2

- RP3 only (as a source if the portable diesel pump is connected to the line)

6.2.1.8 Flow meters

Three magnetic pipe flow meters are currently installed at the site. One is situated on the primary 500mm siphon at RP1 to measure water volumes released to the Edith River. The second is installed on the input line to the WTP to measure the volumes of water pumped through the WTP. A third flow meter has been installed with the RP3 dewatering pumps common manifold to monitor flow output to Batman Creek. Additional flow meters are installed on the RP2 and RP5 discharge lines.

6.2.1.9 Gauging stations

Three stream gauging stations currently exist at the Mt Todd site. The Horseshoe Creek and Stow Creek (SW3) stations were commissioned by the DME in 2008 as part of environmental assessment activities, and a new SW4 gauging station installed by Vista Gold in late 2012. All three sites collect continuous stream water level, and water quality parameters of EC, pH and Temperature. A rainfall gauge also currently exists at the Horseshoe Creek station and flow is calculated through an empirically derived rating table.

Other continuous monitoring systems at the site are the water level monitoring station at RP1 (late 2012 installation) and the site Weather station (mid 2011 installation)

All continuous monitoring stations are connected to the site telemetry to provide real time information at the site office and over the company intranet. Figure 16 illustrates the locations of the water monitoring stations. The Site weather station is located atop the ridge to the west of the RP7 scats dump and was selected as the most stable long term position, representative of the site and unlikely to be affected by any future mining activity.

6.2.1.10 Surface water monitoring locations

Surface water sampling locations across the site and are detailed in Table 18 and their respective locations illustrated in Figure 16. All sites have varying sampling requirements and times, some locations such as SW2, SW4 and SW10 are requirements of the WDL, with other such as SW14 or SW12 monitored for internal purposes. Physical and chemical samples are taken as required at most monitoring sites, with additional samples collected at SW2, SW4 and SW10 during periods of controlled release.

Table 18 - Surface Water Monitoring Locations

Location	Description	Latitude	Longitude
SW2	Edith River upstream of mine	-14.17194471	132.1198981
SW3	Stow Creek Downstream of Batman Creek	-14.16143741	132.1185117
SW4	Edith River downstream of West Creek	-14.1706686	132.098347
SW5	Batman Creek downstream of mine	-14.14783263	132.1156704
SW7	Burrell Creek downstream of mine	-14.16533368	132.1079651
SW10	Edith River downstream of mine	-14.18463718	132.0303688
SW11	Horseshoe Creek downstream of mine	-14.13632611	132.1281727
SW13	Stow Creek upstream of Horseshoe creek confluence	-14.15605208	132.129894
RP1	Retention Pond 1	-14.16306406	132.1072276
RP1 Spillway	Water from RP1 when discharging via spillway	-14.16334286	132.1046916
WRD Weir 1	Weir 1 on southern Toe of WRD	-14.15497097	132.1112862
WRD Weir 2	Weir 1 on southern Toe of WRD	-14.15506615	132.111596
WRD Weir 3	Weir 1 on southern Toe of WRD	-14.15492912	132.1051241
RP1 Siphon A	Discharge point 1 from primary siphons	-14.16355	132.1073844
RP1 Siphon B	Discharge point 2 from primary siphons	-14.16355215	132.1074238
RP2	Retention Pond 2	-14.13900123	132.1105751
RP2 Spillway	Water from RP2 when discharging via spillway	-14.13848504	132.1103263
RP3	Retention Pond 3 (Batman Pit)	-14.14032773	132.1026623
RP5	Retention Pond 5	-14.14157675	132.1129599
RP5 Spillway	Water from RP5 when discharging via spillway	-14.14118347	132.1132553
RP7	Retention Pond 7	-14.12763543	132.1174275
HLP	Heap Leach Pad	-14.14085911	132.1198629
RWD	Raw Water Dam	-14.12312228	132.1320079
SW14	Stow Creek below HLP drain confluence	-14.15702332	132.1244979
SW12	West Creek upstream RP1 Spillway confluence	-14.16406393	132.1035284
SW15	Edith River upstream Burrell Creek confluence	-14.17148983	132.1069033

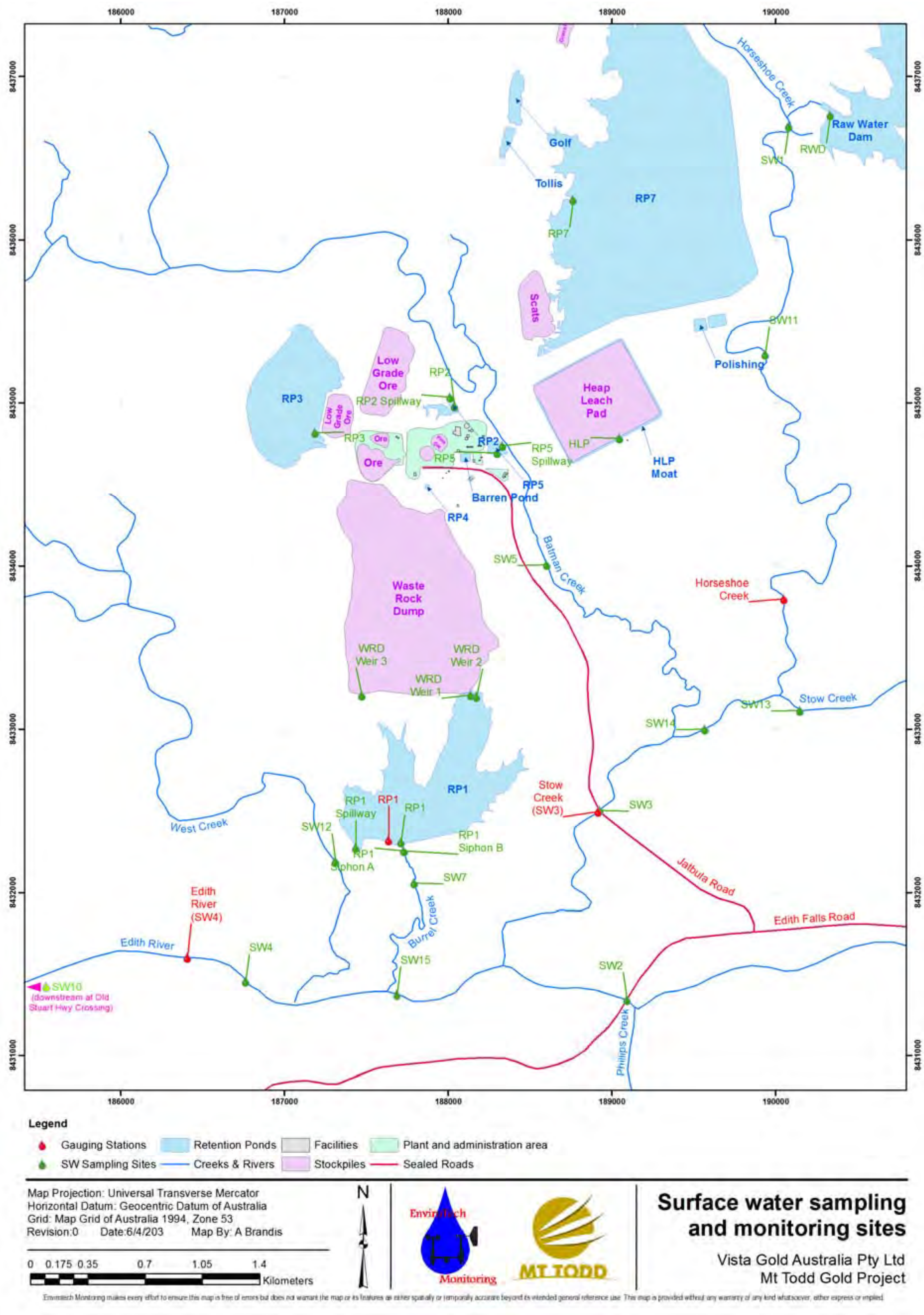


Figure 16 - Surface Water Sampling Locations

6.2.2 Management challenges

6.2.2.1 Potential contaminants

The Mt. Todd mine is a brownfield site, with various sources of potential contaminant generation. The geologic host is a hard, competent greywacke (silicified shale) containing small quantities of various sulphide minerals which, in addition to hosting gold and silver, also host a variety of other metals including iron, copper, lead, zinc, aluminium and cadmium. Surface water flows on the Mt. Todd mine site are a direct result of the seasonal rains during the wet season and are the prime mechanism in the rapid mobilization and transport of potential contaminants.

As the sulphide minerals are exposed to the atmosphere, a decomposition (or oxidation) of the mineral can occur. The result of this oxidation is the liberation of metal ions and combination of sulphur with oxygen to form sulphate. Generally this reaction is superficial, the speed of which is driven by the surface area available in combination with environmental conditions such as temperature and available oxygen. Water provides the transport mechanism to wash the oxidized material away and provide a clean surface for the reaction to restart. Water itself may be an additional source of oxygen for the reaction resulting in an excess of free hydrogen ions, which can react with the liberated sulphate ions to form sulphuric acid. The lower pH contributes and often accelerates the speed of the reaction. The sulphide minerals present in the Mt. Todd deposit include iron sulphides (pyrite and pyrrhotite), copper sulphides (bornite, covelite, chalcocite and chalcopyrite), zinc sulphide (sphalerite) and lead sulphide (galena).

In addition to the liberation of metal ions and the generation of acid through the oxidation of sulphide minerals, mined rock may also have various nitrogen/oxygen (NO_x) compounds present as residues from extractive blasting operations or from the degradation of cyanide used in the heap leaching or milling processes. Such contaminants are generally present in specific areas and are remnants from past mining operations.

6.2.2.2 Potential impacts

The potential impact of unrestricted combining of site-contaminated surface water flows with regional surface water flows is the obvious deterioration of water quality. The magnitude of impact being in direct relation to the duration of exposure and levels of contaminants present. The Mt. Todd mine site is not the only source of the metals and compounds discussed in the previous section. There are background metals and compounds that can be identified in water quality analysis results upstream of the Mt. Todd mine site arising either from historical sporadic mining activities or naturally from the area's mineralized geology. The distinction lies in the higher concentration of these contaminants in the mine site surface flows.

Undiluted and untreated, contaminated flows from mine contact water have the potential to impact aquatic life and downstream users in the Edith River ecosystem, local soil and groundwater, and the various flora and fauna which reside within the local area. Heavy metals have the ability to enter the food chain through a variety of pathways such as direct ingestion by benthic filter feeders, adsorption into tissue through cell walls, uptake by plants and the subsequent consumption of contaminated prey and plants by higher order feeders. Stock and domestic drinking water may no longer meet the necessary health limits, recreational uses of the river such as fishing may cease, and other non-direct impacts to downstream human activities may arise.

A detailed identification and assessment of the risks from contaminated surface waters at the Mt Todd sites is presented in the Risk Section of this MMP

6.2.2.3 Legislative requirements

WDL 178-3 was issued on 5th February 2013 and permits the release of water into the Edith River at the following locations

- Confluence of Stow Creek and the Edith River
- Confluence of Burrell Creek and the Edith River
- Confluence of West Creek and the Edith River

The WDL is the dominant legal instrument in relation to water release activities and sets forth the expectations of Vista Gold.

This licence is periodically reviewed and the most current version can be found on the NTEPA website. (http://www.ntepa.nt.gov.au/__data/assets/pdf_file/0009/136656/wdl178_vista_gold_mt_todd_mine.pdf)

6.2.3 Management during previous period 2012 to 2013

Water management activities for the 2012-3 period largely remained consistent with goals of minimising uncontrolled discharges through a combination of controlled (licenced) release and onsite storage of contaminated waters.

The wet season for the previous reporting period was initially very slow to start. Lower than expected rainfall had fallen upon the site by mid-February and until that time management of onsite waters had proven relatively straightforward. However on the 22nd of February the site experienced a significant localised storm which resulted in the uncontrolled discharge of waters from RP2 and RP5. Towards the tail end of the wet season further rainfall produced sufficient flow within the Edith River to permit the very first discharges of treated water from RP3 via the newly installed pumping system, and an opportunity was also taken to release controlled waters from RP1 in efforts to reduce the pressure from localised storm inflows on high water levels within the pond.

6.2.3.1 RP2 and RP5 Uncontrolled release

Between the 20th and 22nd of February 2013 the site had received in excess of 86mm from localised storms. On the 22nd a power and pump failure at RP2 resulted in an inability to control water levels within the pond, and as a result, an uncontrolled discharge occurred via the RP2 spillway from further rainfall during the night. Pumped water from RP5 typically is transferred to RP2 during normal water management operations. However with the loss of capacity in RP2, water could not be transferred from RP5 and as a result freeboard within RP5 was also exhausted.

The spillway breaches were detected by onsite staff at 05:30 hours during routine inspections. Upon detection Vista Gold Management was immediately notified and the relevant authorities subsequently thereafter. Water samples were immediately collected by the company from the respective ponds as well as from monitoring locations SW2, SW3, SW4 and SW10 and immediately dispatched to the laboratory for analysis.

It has been estimated that discharge from the two ponds commenced at approximately 4am on 22 February 2013, ceasing at RP2 at approximately 04:00 on 23 February 2013, and ceasing from RP5 at approximately 12:30 on 23 February 2013. The total volume discharged is not accurately known, though it was estimated that 10ML discharged from RP2 and an equal or smaller volume from RP5.

Fortunately water levels within the Edith River were also elevated from the previous days of rainfall. The actual rates of dilution are unknown, due to the unknown flow rates out of the respective ponds, but are estimated to be higher than 1:200 based on the changes in chemical concentrations from RP2 to SW4 as shown in Table 19. Conclusions from investigations by both Vista Gold and independently by the DME indicate that the uncontrolled releases had no measurable impact the downstream receiving environment.

Table 19 - Dilution rates based on metals with high concentrations within RP2

	DME Samples			Vista Gold Samples				
Filtered Metal	RP2	SW4	Calculated Dilution	RP2	SW2	SW4	Adjusted SW4	Calculated Dilution
AL	21300	178	119.7	22000	180	220	40	550.0
Cu	3740	2.4	1558.3	3800	<1	3	3	1266.7
Mn	4910	25.6	191.8	5400	5	26	21	257.1
Pb	57.3	0.1	573.0	51	<1	<1	<1	
Zn	12500	15	833.3	13000	<1	16	16	812.5

The calculations provided in the table are simplistic and do not isolate the contributions from RP5 and are presented for informative purposes only.

A number of actions have been undertaken since, to limit the likelihood of another similar incident from RP2 and RP5.

- The blown discharge pipeline on the RP2 electric pump was replaced.
- A new junction and valve and flange have been added to the Decant-RP3 pipe which passes RP2. This permanent flange now provides the ability to connect the mobile diesel pump and transfer water from RP2 directly to RP3. This arrangement permits the operation of two pumps simultaneously on the RP2 pond, or the operation of the diesel pump in the event of Electrical or Mechanical failure of the permanent RP2 pump.
- RP2 Pump and associated plumbing have been located to increase the freeboard to 2.7 metres.
- A valve equipped pipe culvert is being installed in the low lying area west of RP2 through to RP2, which will enable a low level drawdown in the catchment and give additional surge control capacity in the RP2 area.
- A discharge pipeline has been constructed from RP5 directly to RP7, thereby eliminating the need to transfer water to RP2 and dependence on RP2's operational status.
- A discharge pipeline has been constructed from RP2 to RP7, thereby eliminating the need to discharge via the water treatment plant.
- The majority of the existing silt within RP5 is scheduled for removal which will increase total buffering capacity of the pond.

6.2.3.2 Controlled Releases

Due to the low volumes of rainfall over the 2012-13 period, controlled releases from site only occurred over April and March 2013. Approximately 23 ML were released from RP3 between 30/3/2013 and 3/4/2013 and 2.3 ML from RP1 on the afternoon of 3/4/2013.

The respective Monthly discharge reports are required by WDL 178-3 are available on both ours and the NTEPA websites and provide additional detail on each of the discharge events.

6.2.3.3 Infrastructure

Throughout the previous reporting period the following major water management infrastructure activities were undertaken

- Modifications to RP2 pipelines to allow connection of the mobile diesel pump to enable parallel pumping from RP2
- Modification and installation of pipelines to permit direct transfer of water from RP5 to RP7
- Installation of new dewatering pump and control system at RP3
- Annual remediation earthworks to these Heap Leach Pad
- Servicing and offsite repairs of RP1 and decant pond pumps
- Repairs and upgrades to electrical switchboard at the decant ponds for reliable power supply to the decant pumps
- Repairs to various onsite electrical distribution lines such as replacement of isolators and surge arrestors
- Minor earthworks such as repairs to drains and culverts
- Minor earthworks and repairs to surface water sampling access roads
- Installation of a new 315 mm pipe at the decant ponds to improve raw water filling and protection of the pond liners
- Installation of a new 37 Kilowatt bore pump into HLP well.
- Operation of the Water Treatment Plant and treatment of pumped waters from RP1, RP5, HLP and RP2.
- Addition of rock and gravel to new RP1 spillway to improve year round vehicle access to the RP1 pumping station
- Poisoning and removal of weeds and vegetation growth from around pipelines and electrical transformers
- Construction of an earthen pad at HLP to permit mobilisation of Diesel pump in emergency situations

6.2.3.4 Projects

One of the most significant water management projects during the previous reporting period has been the Treatment of waters within the Batman Pit. This project has seen the application of up to 10,000 tonne of finely ground Limestone and 2,000 tonne of Quicklime added to the low pH water in an effort to raise the pH and precipitate the dissolved metals from solution. Application of the limestone and intended schedule was hampered by a number of factors including milling bottlenecks and transportation issues. The final application of product to the pit completed in March 2013. Routine profiling of the pit was conducted on a weekly basis to monitor the progress of the limestone, how well the limestone was distributing throughout the pit, and what effect it was having on physical and chemical properties of the water. The project has been very successful with the average pH of RP3 at 7 from its initial starting point of 3.3 and a reduction of up to 90% of the metals in the top 20m of the water column by 30 June 2013. Monitoring of the physical and chemical conditions is ongoing and will provide valuable information on how the chemistry continues to change as the remaining unused limestone is chemically consumed. A selection of results is presented in Figure 17 through Figure 21

The only other project within the reporting period has been a small scale trial of evaporation by irrigation. A small network of pipes and irrigation sprinklers has been installed within the western RP7 catchment. During the trial water was pumped from the RP7 pond through the sprinklers via the portable diesel pump. The trial was conducted to quantify the rates of additional evaporation which could possibly be achieved on top of natural direct pond surface evaporation, and in an effort to identify a possibly dry season approach to the reduction of onsite ARD water. The results are currently under review and consideration by Vista Gold.

6.2.3.5 Monitoring and Assessment

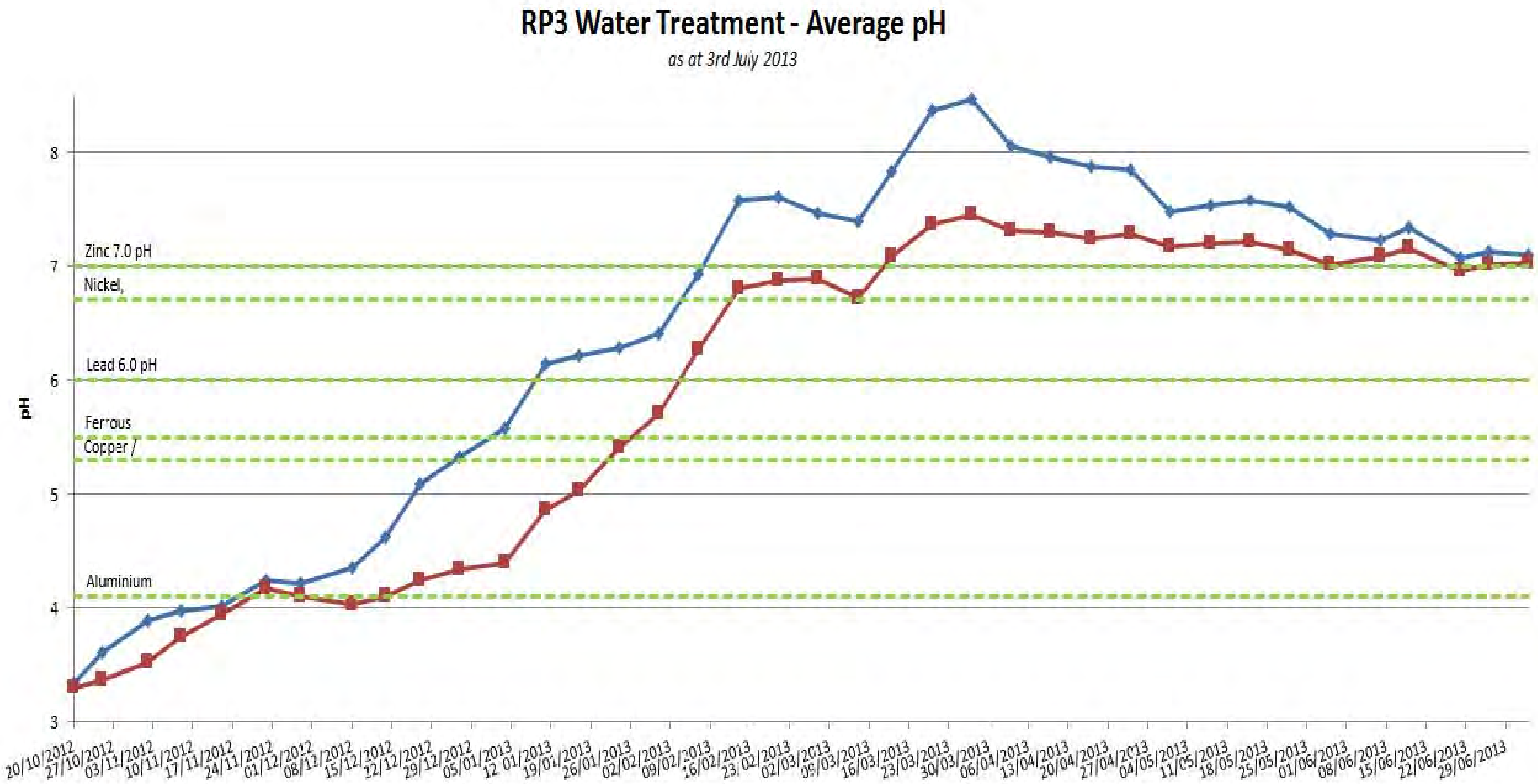
Routine surface and groundwater monitoring was conducted across the site. Results of these monitoring activities for the past reportable period are presented in Section 6.5

Annual Macroinvertebrate and Sediment sampling was conducted in June 2013. The number of sediment sites sampled was significantly increased as outlined in Section 6.4.4. The analysis and results of the monitoring program are currently being compiled and expected to be available in November 2013.

Ecotoxicology assessments were undertaken on treated RP3 water in January and March 2013, RP7 untreated water in October 2012 and untreated RP1 water in March 2012. The results of the ecotoxicology assessments were then used to calculate dilution ratios of discharge from each of the respective ponds. The calculated dilution ratios are to ensure 80% species protection requirements are met at SW4, and also provides a straightforward mechanism for the management and release of onsite waters. The dilution ratios are presented in Table 20 where it can be seen that a significant improvement has been made to RP3 waters as a result of the treatment process. Full results of the Ecotoxicology assessments and dilution calculations are available on the Mt Todd Website.

Table 20 - Calculated dilution rates from Ecotoxicology assessments

Source	Date of applicable water quality	Dilution Rate	Comments
RP3	Jan 2013	1:1,123	Based on near surface sample
	Mar 2013	1:20	Based on sample 10m below the surface
RP1	Mar 2012	1:1,000	Untreated Water
RP7	Oct 2012	1:4,545	Untreated Water



	20/10/2012	27/10/2012	03/11/2012	10/11/2012	17/11/2012	24/11/2012	01/12/2012	08/12/2012	15/12/2012	22/12/2012	29/12/2012	05/01/2013	12/01/2013	19/01/2013	26/01/2013	02/02/2013	09/02/2013	16/02/2013	23/02/2013
Top 20m	3.35	3.61	3.89	3.97	4.02	4.24	4.21	4.35	4.62	5.09	5.33	5.57	6.14	6.22	6.29	6.41	6.92	7.58	7.60
Whole Pit	3.29	3.37	3.53	3.75	3.94	4.17	4.09	4.03	4.10	4.25	4.35	4.39	4.87	5.02	5.41	5.70	6.26	6.80	6.87

	02/03/2013	09/03/2013	16/03/2013	23/03/2013	30/03/2013	06/04/2013	13/04/2013	20/04/2013	27/04/2013	04/05/2013	11/05/2013	18/05/2013	25/05/2013	01/06/2013	08/06/2013	15/06/2013	22/06/2013	29/06/2013
Top 20m	7.45	7.39	7.82	8.47	8.05	7.95	7.87	7.84	7.47	7.53	7.57	7.52	7.28	7.22	7.34	7.07	7.12	7.09
Whole Pit	6.88	6.72	7.08	7.45	7.30	7.29	7.23	7.28	7.16	7.19	7.21	7.13	7.01	7.09	7.15	6.95	7.01	7.02

Figure 17 - Average pH change within RP3 up to 3/7/2013

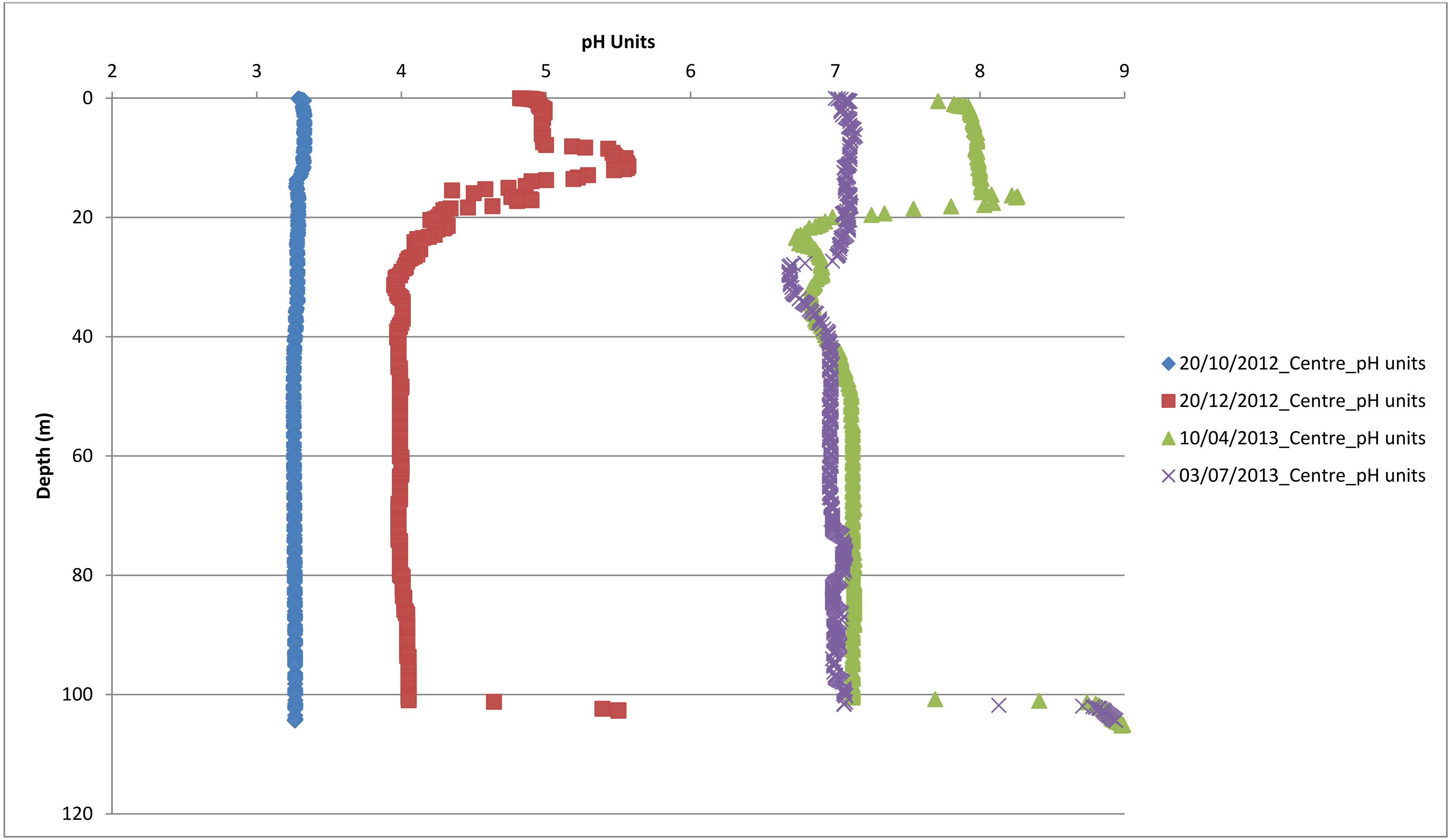


Figure 18 - Selection of pH readings over time vs depth

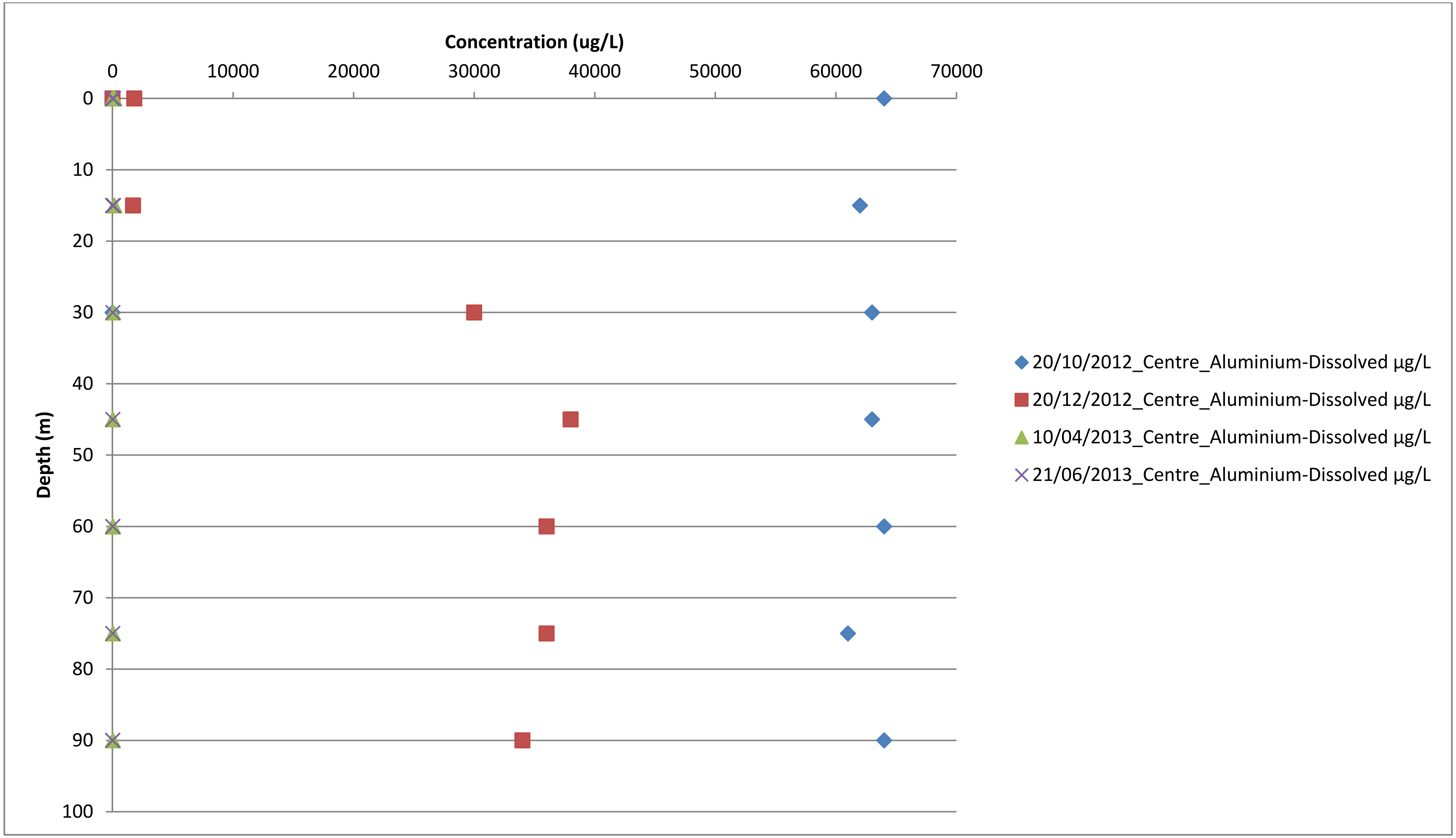


Figure 19 - Selection of 0.45um Filtered Aluminium concentrations over time vs depth

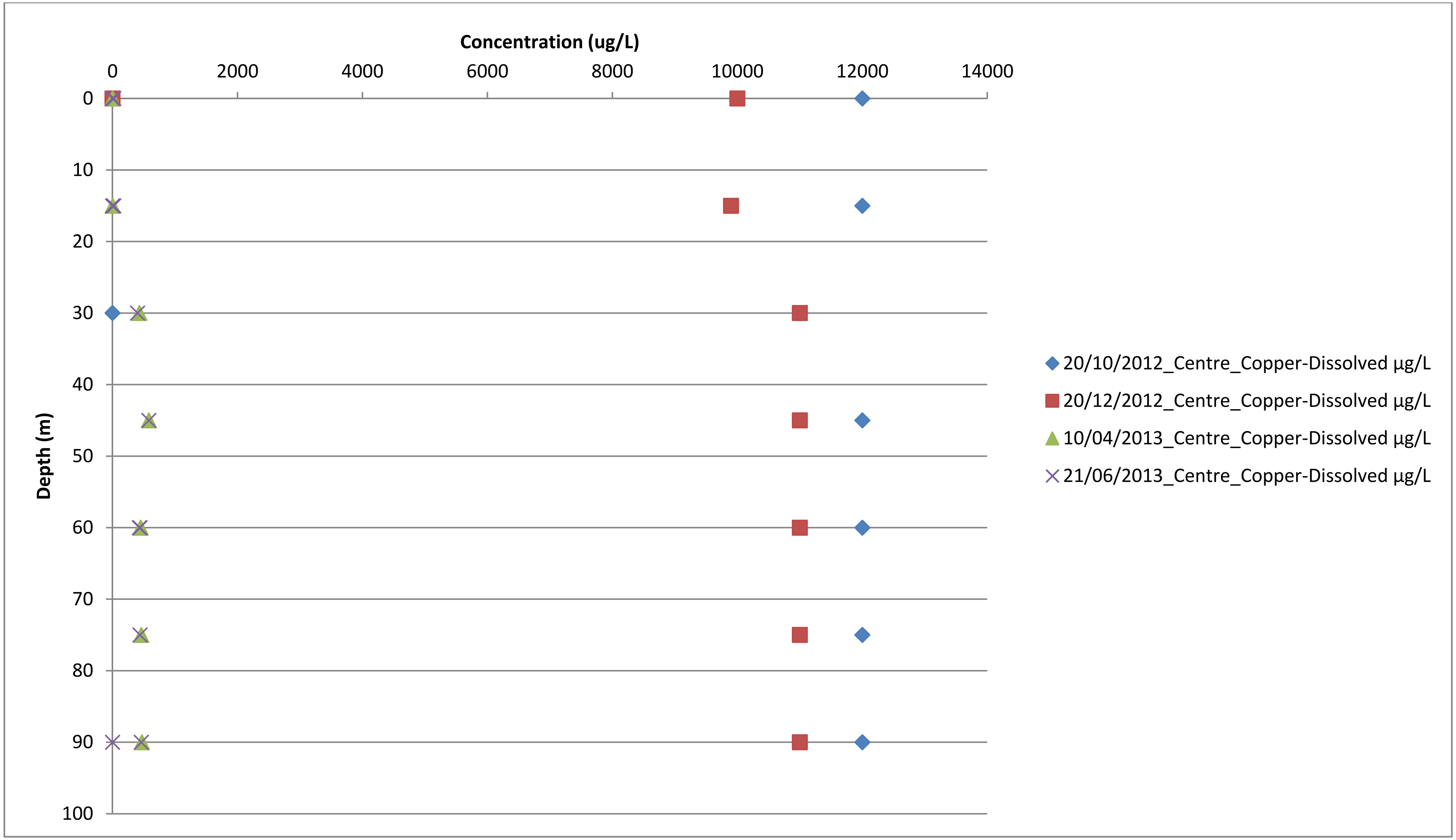


Figure 20 - Selection of 0.45um Filtered Copper concentrations over time vs depth

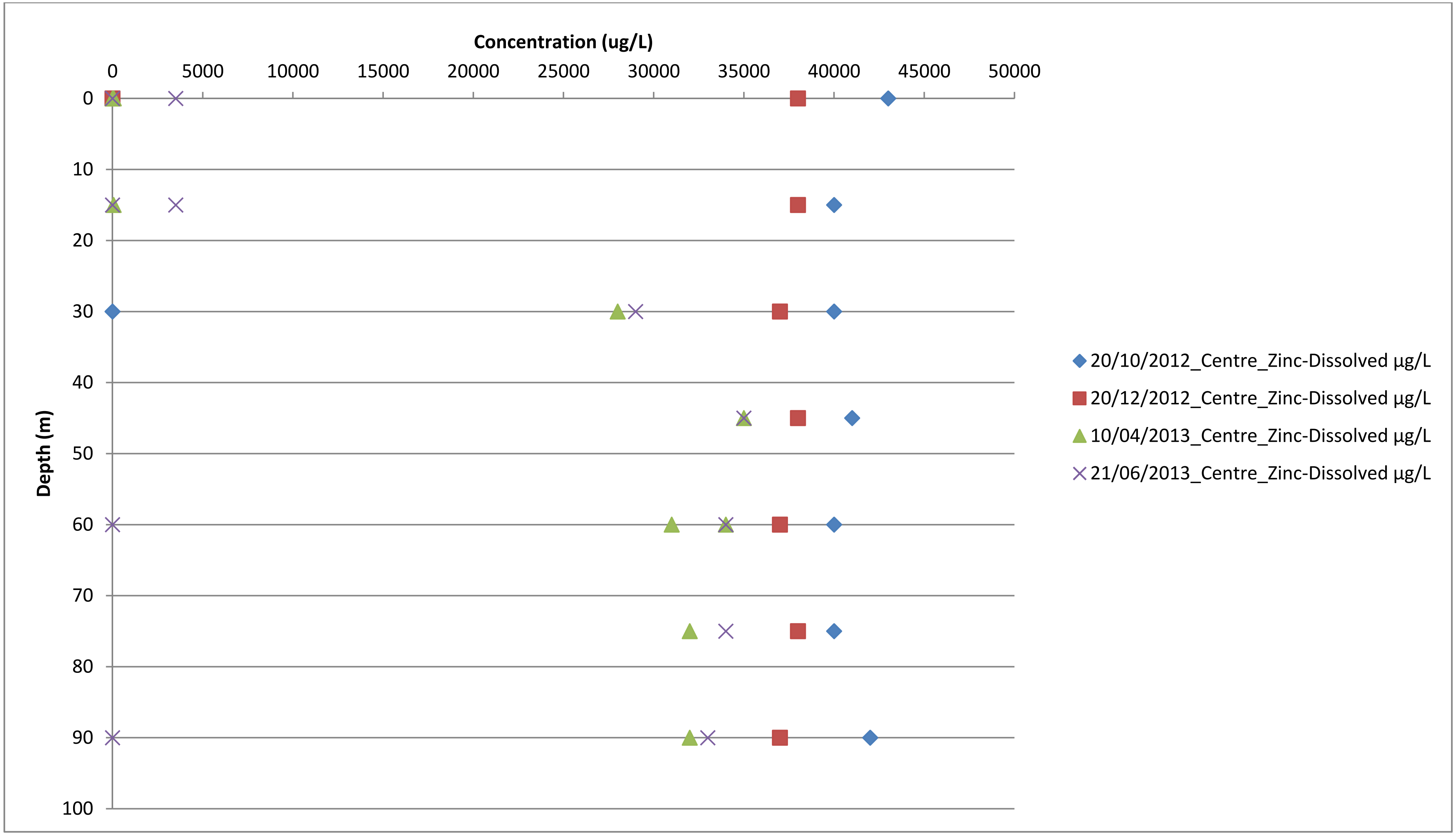


Figure 21 - Selection of 0.45um Filtered Zinc concentrations over time vs depth

6.2.4 Management for the upcoming period

The potential impacts over the forthcoming period continue to be those identified in section 6.2.2 and in general the operational water management activities will remain the same over the foreseeable future. However one of the primary changes to WDL 178-3 was the approval to discharge waters into the Edith River at such dilution to achieve an 80% level of species protection. This licence effectively improves the quality of diluted waters in the Edith River compared with previous years yet still enables Vista Gold to release significant volumes of water from site at a ratio directly related to the quality of such water. The most significant change to water management from previous years is therefore the newly established capacity to discharge treated waters from RP3. The goal of water management still remains to reduce the total volume of onsite waters and ensure that all licence conditions are met

6.2.4.1 Water pumping and release strategy

Table 21 outlines the ongoing care and maintenance related water pumping and monitoring activities that will largely be adopted over the forthcoming reporting period until external conditions change.

Table 21 - Annual water transfers and monitoring prodecure

Water Transfers	Monitoring
RP1	
Maintain freeboard by pumping untreated waters to RP7. Alternatively treat waters via WTP and redirect to RP3. October to February – pump if freeboard is less than 2.5m March to April – pump if freeboard is less than 1m Dry season – pump if major rainfall is expected and freeboard is less than 0.5m Discharge to Edith River through siphons when license conditions can be met, and when no other discharges are occurring to the Edith River from any other source April to November – maximise evaporation opportunities	RP1 level (daily during wet) Flow to RP-3 (cumulative and instantaneous. Daily recording of WTP flow meter and pump operating times) Discharge to Edith River through siphon (cumulative and instantaneous. Daily recording of flow meter and siphon operating times) Pump infrastructure (weekly)
RP2	
Maintain freeboard by pumping untreated waters to RP7. Treat waters via WTP and redirect to RP3 when risks from further reduction of RP7 freeboard are considered too high. Pump to RP7 when WTP in use by another exclusive source (typically RP1) Pump if freeboard is less than 2m	RP-2 level (daily during wet) Flow (cumulative and based on pump running times or WTP flow meter) Pump infrastructure (weekly)
RP3	
Siphon, if possible, to Batman Creek when licence conditions and Edith River dilution rates can be met and no other discharges are occurring to the Edith River from any other source	RP-3 level (daily during wet) Flow (cumulative and instantaneous. Daily flow meter recording and siphon or pump operating times) Pump infrastructure (weekly)

Pump to Batman Creek when licence conditions and Edith River dilution rates can be met and authorisation is obtained from the General Manager to commit to the expenditure associated with this. Can receive excess water from RP1, RP2 and the Heap Leach moat via the WTP as treated water.	
RP-5	
Maintain freeboard by pumping to RP7 Pump if freeboard is less than 2m Pump to RP2 if RP7 is approaching capacity	RP-5 level (daily during wet) Flow (cumulative and based on daily pump running times) pump infrastructure (weekly)
Heap Leach Facility	
Maintain freeboard by pumping untreated waters to RP7. Treat waters via WTP and redirect to RP3 when risks from further reduction of RP7 freeboard are considered too high. Pump to RP7 when WTP is in use by another exclusive source (typically RP1) October to April – pump if moat freeboard is less than 0.75m Dry season – pump if moat freeboard is less than 0.5m and heavy rain is expected November to April – pump if moat freeboard is less than 0.5m Dry season – pump if moat freeboard is less than 0.5m and heavy rain is expected	Heap leach moat level (daily during wet) Flow (cumulative and based on daily pump operating times or WTP flow meter) pump infrastructure (weekly)
RP-7	
October to March - Discharge to Horseshoe Creek via decant ponds when license conditions can be met i.e. no other discharges are occurring to the Edith River from any other source and freeboard less than 0.1m from base of spillway plug October to March – Pump untreated to RP3 when water level is at base of spillway. Redirect all pumped inputs to RP3. April to November – maximise evaporation opportunities Receives water from RP5 and HLP when WTP in use	RP7 level (weekly) Flow to RP3 (cumulative and based on pimp operating times) Pump infrastructure (weekly)
RWD	
Supplies water as required for fire control, exploration programs, and the WTP	RWD level (weekly)

WTP	
Receive, treat and discharge to RP3 pumped water from RP1, RP2 or HLP when risks from further reduction of RP7 freeboard are considered too high.	Lime in silo (daily) Plant operation (daily and over 24 hour period if required)

6.2.4.2 Other known specific projects

It is difficult to accurately outline all of the water management related activities likely to occur over the forthcoming reporting period due to the complexity of current site conditions and yet to be decided investment decisions on the resumption of mining. However the following specific water management projects are expected to occur in the near future.

- Removal of siltation from RP5 pond to increase the storage and inflow buffering capacity.
- Further testing of irrigation or other evaporation techniques in an effort to identify a potentially economically feasible alternative to ARD water reduction
- Investigate the application of a Siphon pipeline from RP3 to Batman creek to permit controlled discharges at lower flows and minimise expense in operation of variable speed pumps.
- Undertake a survey of Edith River fish and assessment of potential risks to community recreational capture and consumption.
- Undertake bathymetric surveys of the onsite retention ponds to improve confidence in height to volume relationships and information which is derived from such data. Work to be done in conjunction with surface area topographic survey between the water level and spillway and retaining wall limits.
- Relocate the WTP to RP3 discharge line so discharges from the WTP occur well below the discharge pump intake level in an effort to minimise the amount of possible contamination pumped inflows may have on the high quality at the intake level of existing treated water.
- Install additional pipework and connections at RP5 and the HLP to permit connection of the mobile diesel pump in emergency situations.
- Direct discharge line from HLP to RP7.
- Repeat Ecotoxicology testing of RP3 and RP1, and potentially RP7 waters prior to the respective successive wet seasons. This will ensure dilution rates are as accurate as possible and will maximise potential flow rates from the improved waters in RP3.
- Undertake construction of eastern RP1 diversion drain in an effort to further reduce the total volume of uncontaminated inflow.

Consider the extension of the Macroinvertebrate and sediment monitoring programs to include Stow Creek

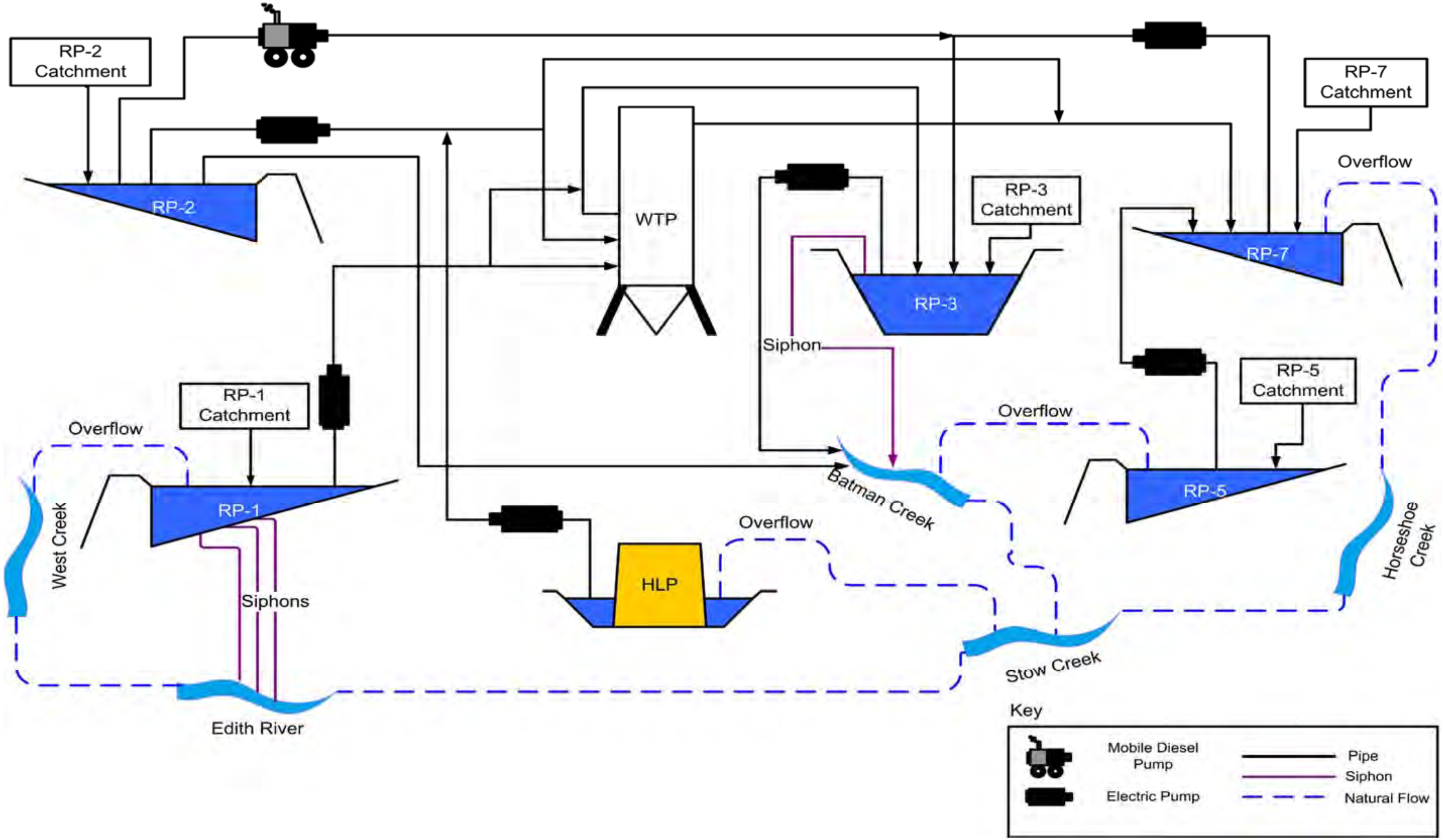


Figure 22 - Pumping and water transfer paths

6.3 Groundwater

6.3.1 Groundwater management infrastructure / features

6.3.1.1 Groundwater bores and monitoring piezometers

A number of groundwater bores were installed in the early 1990's during the early stages of the initial MT Todd project development with an aim to develop a reliable water supply for milling operations. The BW prefix named bores focussed on the exploration and testing of groundwater as a resource for the mine in the Burrell Creek Formation and a number were subsequently fitted with pumps. However the aquifers of the local area are primarily of the fractured rock type, and as a result only low flow rates from individual bores were achieved. At one stage of the project a number of groundwater bores were connected onto a ring main in efforts to bolster supply quantity and consistency.

A number of monitoring bores/piezometers were also installed during operations, primarily nearby to surface water structures to facilitate monitoring programs. Construction and documentation standards of adequate head works, casing packing or machine slotted screens for the majority of these monitoring bores are generally poor with most being absent, as evidenced by onsite camera inspections.

Since operations ceased the majority of any groundwater pumping infrastructure has been removed, abandoned or in the case of pipelines, claimed by fire. Little or no maintenance has been conducted to the existing groundwater bores since. A number of bores still contain old pumps that have become silted in place, have damaged casings from fire, exhibit artesian flow or permit surface waters to directly enter the groundwater due to an absence of adequate standpipe height or capping.

Construction of a number of additional monitoring piezometers was undertaken in 2011 in conjunction with EIS base line studies and TSF investigations. An audit of the groundwater bores across the site was also conducted in 2010-11 in an attempt to physically identify bores listed in various literature, the results of which are presented in Table 22 and Figure 24.

A small amount (approximately 3 ML) of groundwater is extracted from BW6P bore using existing pumping infrastructure for use in care and maintenance activities. Working pumping infrastructure is also present at BW10P but not actively used.

6.3.1.2 Other groundwater management infrastructure

To the company's knowledge no bores or other infrastructure were used for groundwater injection or groundwater contaminant recovery. No other specifically engineered structures, other than the TSF underdrainage system or lined retention ponds, have been identified on the site for the purposes of seepage limitation, interception and mitigation.

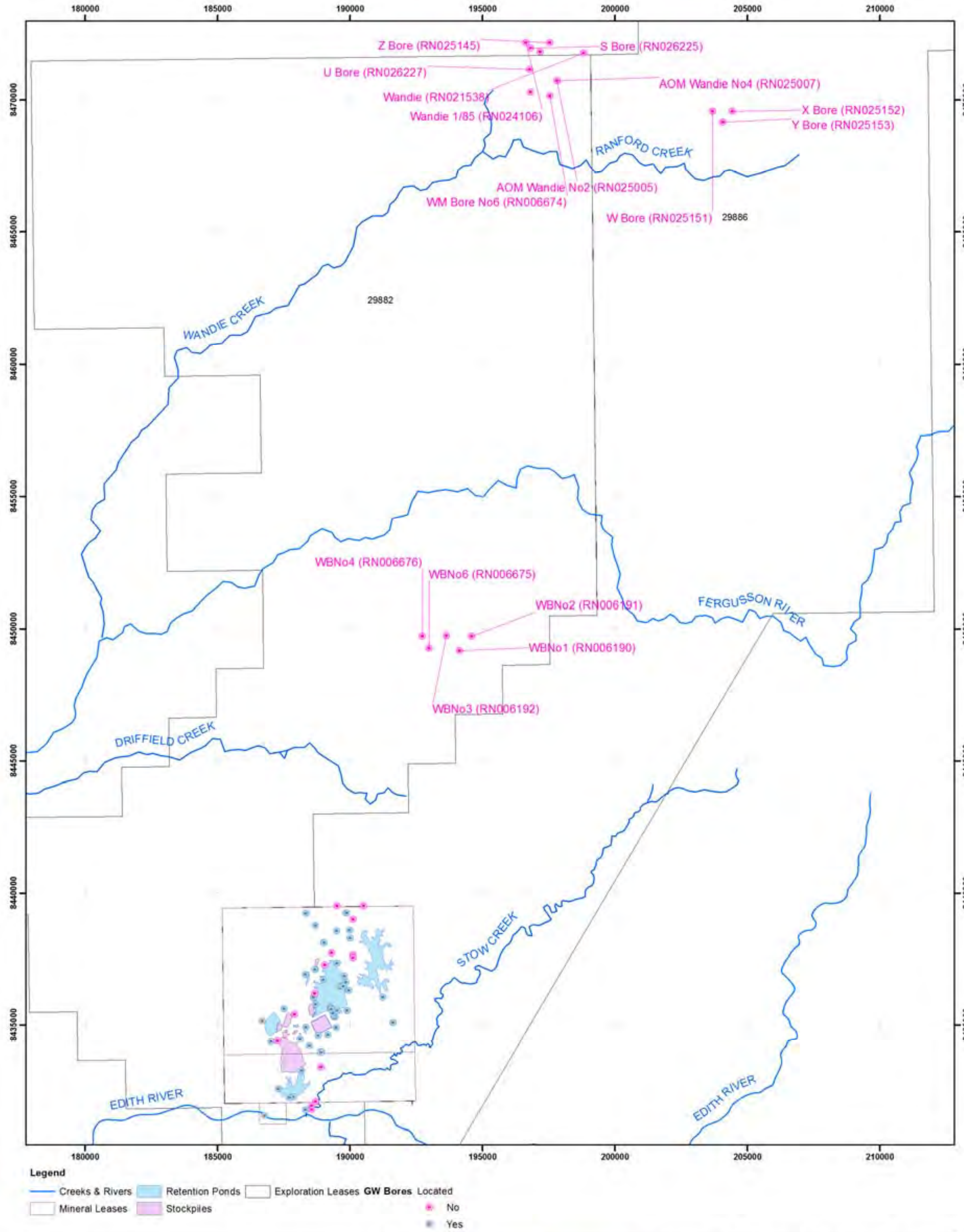
Groundwater bore logs are available in Appendix K of the Draft EIS (http://www.ntepa.nt.gov.au/environmental-assessments/assessment/register/mount_todd_gold/mount-todd-draft-eis)

Table 22 - Groundwater Bores and Piezometers

Bore ID	Physical Located	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
1	Yes	MB4		189468.862	8434893.873	129.57
2	Yes	MB3		189158.000	8434624.000	
3	Yes	MB5		189426.530	8435302.350	

Bore ID	Physical Located	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
4	Yes	TDMB1S		189383.157	8435346.942	124.77
5	Yes	TDMB1D		189381.372	8435351.568	124.56
6	Yes	TDMB2D		189887.907	8435549.062	123.87
7	Yes	TDMB2S		189882.008	8435544.065	124.07
8	Yes	MB1		188099.519	8434470.273	131.06
9	Yes	BW1P	RN026130	188331.699	8434907.204	127.56
10	Yes	MB6S		187714.200	8432246.700	
11	Yes	MB7S		187855.290	8432280.520	113.48
12	Yes	BW29	RN029361	188306.790	8431781.467	112.80
13	Yes	BW29P	RN029363	188306.845	8431788.955	112.90
14	Yes	BW5		187506.717	8435612.504	142.88
15	Yes	TDMBD1		188670.070	8437099.535	143.16
16	Yes	TDMBS1		188665.099	8437099.165	143.21
17	Yes	TDMB4D		189497.626	8437339.708	132.44
18	Yes	TDMB4S		189499.168	8437336.876	132.03
19	Yes	TDMB3D		189937.183	8436307.725	125.32
20	Yes	TDMB3S		189941.531	8436310.490	125.24
21	Yes	BW10P	RN026132	188452.606	8434213.144	123.30
22	Yes	BW6P	RN026131	188893.019	8433988.369	121.54
23	Yes	BW19P	RN026149	188997.127	8438108.581	138.45
24	Yes	BW19		189008.513	8438106.611	138.33
25	Yes	BW23P	RN028927	189484.649	8438548.430	141.36
26	Yes	BW23	RN028922	189485.511	8438551.786	141.49
27	Yes	BW18		189859.603	8439226.397	140.69
28	Yes	BW18P	RN026350	189861.874	8439232.408	140.64
29	Yes			189978.976	8438586.333	145.16
30	Yes			189975.405	8438588.014	145.13
31	Yes		RN028926	189992.456	8438278.191	145.52
32	Yes		RN028923	189991.450	8438281.571	145.36
33	Yes			188680.384	8438755.031	139.35
34	Yes	BW17P	RN026354	188326.269	8439214.794	141.85
35	Yes	BW17		188334.493	8439215.977	142.33
36	Yes	BW8P	RN026134	188788.000	8434591.000	
37	Yes	MB7D		187846.510	8432275.370	
37	Yes	TSF2MB01		191239.441	8436060.050	138.77
38	Yes	TSF2MB02		191608.559	8435084.255	141.36
39	Yes	BPMB02		187012.310	8434374.822	145.67
40	Yes	BPMB01		186675.178	8435148.078	171.64
41	Yes	WDMB01		187284.957	8432583.777	124.15
45	Yes	1D		189841.626	8436628.220	165.49
49	Yes	2D		189320.141	8435537.659	
50	Yes	2E		189349.770	8435444.039	
51	Yes	3A		189509.339	8435553.436	
52	Yes	4A		189780.333	8436857.245	
53	Yes	MB6D		187709.730	8432246.020	
54	Yes	WDMB02		188162.236	8433274.432	125.74
55	Yes	SW04MB01		186767.924	8431559.732	111.64
56	Yes	BW6		188895.028	8433966.356	121.27

Bore ID	Physical Located	Bore Number as marked on casing	RN Number	Northing	Easting	Elevation
57	Yes			188314.030	8436915.960	
58	Yes	5A		188686.581	8435794.500	
59	Yes	6A		188614.787	8436037.641	
60	Yes	7A		188978.006	8436707.673	
61	Yes					
62	Yes	1A		189607.130	8436467.740	
63	Yes	1B		189673.262	8436470.282	
64	Yes	1C		189740.323	8436473.113	
65	Yes	2A		189241.080	8435674.092	
66	Yes	2B		189259.607	8435632.574	
67	Yes	2C		189277.823	8435591.473	
68	No		RN024355	189500.000	8439500.000	
69	No		RN025088	190100.000	8439000.000	
70	No		RN026133	190500.000	8439500.000	
71	No	bw16p	RN026351	189300.000	8437720.000	
72	No	bw15p	RN026352	189040.000	8437280.000	
73	No		RN026353	188660.000	8436200.000	
74	No	bw25	RN028924	190100.000	8437650.000	
75	No	bw25p	RN028925	190100.000	8437550.000	
76	No	bw26	RN028928	188900.000	8433400.000	
77	No	bw27p	RN028929	188700.000	8432100.000	
78	No		RN028950	729490.000	8611060.000	
79	No	bw28	RN029360	188550.000	8431800.000	
80	No	bw28p	RN029362	188550.000	8431950.000	
81	No	bw30p	RN029364	187250.000	8434400.000	
82	No	bw31p	RN029365	187900.000	8435400.000	
83	No	WBNo1	RN006190	194128.000	8449164.600	
84	No	WBNo6	RN006675	192978.000	8449264.600	
85	No	WBNo2	RN006191	194578.000	8449714.600	
86	No	WBNo4	RN006676	192728.000	8449714.600	
87	No	WBNo3	RN006192	193628.000	8449744.600	
88	No	X Bore	RN025152	204427.900	8469564.400	
89	No	Y Bore	RN025153	204057.900	8469164.400	
90	No	W Bore	RN025151	203677.900	8469564.400	
91	No	Wandie	RN021538	198827.900	8471764.400	
92	No	AOM Wandie No4	RN025007	197807.900	8470714.400	
93	No	AOM Wandie No2	RN025005	197807.900	8470714.400	
94	No	AOM Wandie No1	RN024858	197807.900	8470714.400	
95	No	AOM Wandie No3	RN025006	197807.900	8470714.400	
96	No	WM Bore No6	RN006674	197527.900	8470164.400	
97	No	Z Bore	RN025145	197527.900	8472164.400	
98	No	T Bore	RN026226	196807.900	8470304.400	
99	No	V Bore	RN026228	197167.900	8471814.400	
100	No	U Bore	RN026227	196777.900	8471149.400	
101	No	S Bore	RN026225	196807.900	8471954.400	
102	No	Wandie 1/85	RN024106	196627.900	8472164.400	



Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 53
Revision:0 Date:6/4/203 Map By: A Brandis

0 1 2 4 6 8 Kilometers

N

Groundwater Bores across ML & EL's

Vista Gold Australia Pty Ltd
Mt Todd Gold Project

Figure 23 - Groundwater Bore and Piezometer across mineral and exploration leases

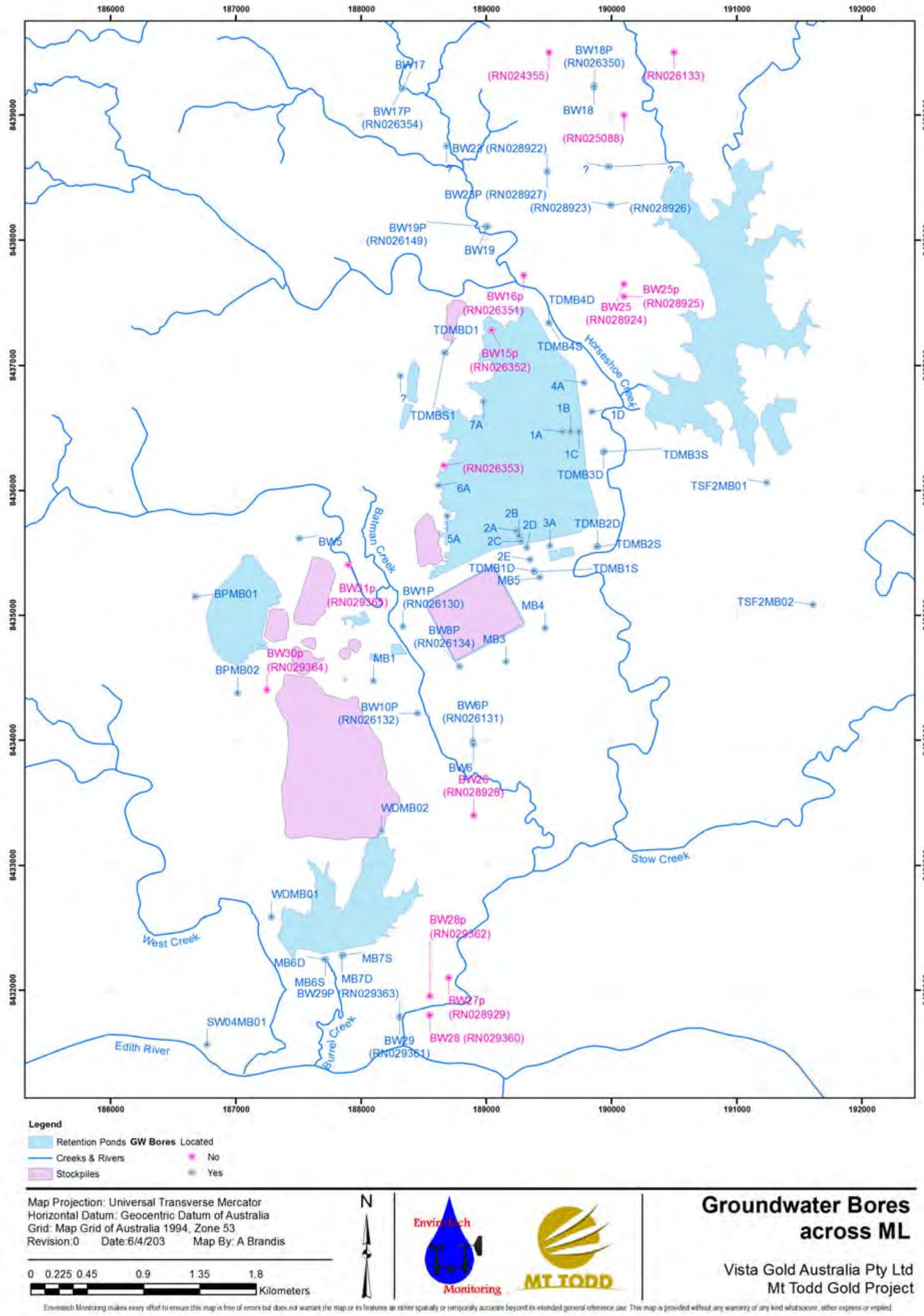


Figure 24 - Groundwater Bores and Piezometers across the main site facilities

6.3.2 Management challenges

6.3.2.1 Potential contaminants

The various potential contaminants as discussed for surface waters in section 6.2.2.1 also have the potential to enter ground waters. The extent to which this is occurring at the Mt Todd site is largely driven by:

- The measures taken during construction of retention ponds, waste rock and ore stockpiles to minimise groundwater seepage.
  Such measures are known to exist for the HLP and RP5 where impermeable plastic linings were installed as part of their construction, for RP7 in the form of the underdrainage network and soil improvements, but for other structures such as RP2, RP1 or the stockpiles no specific measures are known.
- The effectiveness of the seepage barriers / control systems
  The groundwater monitoring results infer a possible compromise in the lining of the HLP, and the closure of the underdrainage system over the past 10 years is likely to have increased seepage rates below RP7 .
- The porosity and transmissivity of the geologic host work to date suggests that groundwater aquifers below the site are generally composed of water within the cracks and fractures of the rock with the weathered upper geological layer playing a greater role in localised recharge and discharge. Hydraulic conductivities are generally low but notable in specific locations such as the surface seeps below RP1 and RP7.

Other minor contaminants could include the various hydrocarbons or chemicals such as herbicides if managed inappropriately. The likelihood of these contaminants entering the ground waters at Mt Todd is very low due to the small volumes maintained and utilised on site and the presence of appropriate storage and handling procedures.

6.3.2.2 Potential impacts

The primary impact of contaminated ground water is the reduction in water quality for other surrounding groundwater users and the contamination of surface water streams, rivers and lagoons as ground waters are released to the surface via springs and other groundwater sinks.

While the potential contaminants are significant, for the Mt Todd site the general opinion from investigations to date, suggest that there exists limited ability for such contaminants to travel significant distances. This attenuation of transport exists throughout the majority of the site, particularly in higher areas where porous material is absent, and therefore restricts any potential impacts to the immediate area.

The horseshoe creek catchment below RP7 is expected to be the area of most significant impact as a result from the cessation of correct Tailings Storage Facility management facilitating increased seepage. A number of bores below the TSF exhibit high concentrations of elements unequalled across the site and surface waters within the creek exhibit characteristics consistent with the contamination and subsequent transport through the surrounding alluvium.

The neighbouring and regional land uses do not share substantial groundwater resources with the mine site, with the nearest neighbouring bores being over six kilometres away (upstream) at the Werenbun community and Edith Falls recreational area. Results from monitoring of down gradient bores approximately 500m from RP1 has failed to identify any chemical signatures similar to that of the pond water. Results from dry season sampling of the Edith River also do not report elevated contaminants or evidence any information of direct groundwater contamination.

6.3.3 Management during the previous period

No specific direct management or mitigation activities were undertaken on site in regard to ground waters. No abstraction of ground waters was conducted other than that the small amount used for site facilities and care and maintenance activities from Bore 6. The recharge rates around this bore exceed demand and in the absence of any large scale extraction or injection no drawdown monitoring or assessments are currently conducted.

The only reportable groundwater related activities for the period include –

- Routine monitoring of groundwater quality
- Ongoing review of the RP7 acidity generation and migration study
- Hydrological investigations and modelling as part of the EIS

6.3.4 Management during the upcoming period

No specific activities in relation to groundwater management are proposed for the forthcoming life of mine plan other than the routine annual monitoring program.

In anticipation of future site developments, extension of the monitoring program is currently being considered to collect additional baseline information from a range of additional existing bores across the site. These areas of consideration include

- The historical “Quigley’s” area to the north of the TSF
- The inclusion of monitoring bores installed during RP7 acidity generation and migration study
- The resurrection and inclusion of other legacy bores currently abandoned and inoperable for various reasons.

An investigation will also be undertaken to determine the availability and suitability of any regional neighbouring bores for inclusion to the longer term groundwater monitoring program.

An ongoing review of groundwater results will be conducted to assess the spatial temporal variations in quality and to inform more strategic approach to future groundwater sampling activities.

Until a final investment decision is made, no additional groundwater monitoring bores will be installed at the site.

6.4 Monitoring

Annual, routine water related monitoring programs at the site are driven primarily by regulatory requirements with additional programs implemented by Vista Gold for the purpose of investigation and information gathering.

A number of specific monitoring activities have been conducted toward the completion of the EIS, but are not anticipated to be continued on a regular basis unless business needs indicate otherwise.

Prior to returning the site to any active mining, the monitoring programs will be reviewed to ensure adequate baseline data is available in order to qualify and quantify the effects from such activities.

6.4.1 Monitoring permits and agreements

The majority of current surface or groundwater monitoring activities take place within the existing mineral or exploration leases. The majority of surrounding lands are owned by the Jawoyn Aboriginal Corporation with whom Vista Gold have established working agreements which permit access and operational activities such as the necessary environmental sampling programs.

In addition to the direct agreements with the Jawoyn association, certificate C2012/137 has been obtained from the AAPA to undertake a number of activities including “routine environmental monitoring and management activities”.

Where other specific permits for aquatic related sampling are necessary (e.g. non recreational sampling of fish), licenced external consultants are engaged.

6.4.2 Surface water monitoring

To meet the requirements of WDL 178-3 sampling encompasses the following sites-

- RP1 - Waste rock wastewater source
- RP3 – Batman Pit
- RP7 – Tailing Storage area
- SW2 – Edith River at Bridge on Edith Falls road
- SW4 – Edith River downstream of RP1 siphon and spillway discharge
- SW10 – Edith River at old Stuart highway causeway

Samples must be collected on the following schedule -

- Daily when discharging
- 1 week after the cessation of discharge
- Once during the period of first flush

Physical parameters measured include –

1. Discharge flow rate
2. River flow rate
3. River height
4. Temperature
5. Electrical Conductivity
6. pH
7. Dissolved Oxygen

and samples must be analysed for the following parameters

- Sulphate
- Bicarbonate
- Unfiltered Alkalinity CaCO3
- Hardness CaCO3
- Total Dissolved Solids
- Total Suspended Solids
- Sodium
- Chloride
- Calcium
- Cyanide
- Aluminium
- Cadmium
- Cobalt
- Copper
- Chromium III
- Chromium VI
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Nickel
- Zinc

The specific matrix of sampling sites, parameters and frequencies are specified in the WDL. Surface water sampling is conducted by onsite staff following the procedures listed in the Vista Gold Surface water sampling standard operating procedure which is included in an appendix of the Discharge Plan available via NT EPA website. (http://www.ntepa.nt.gov.au/__data/assets/pdf_file/0004/144913/WDL178_vista_gold_discharge_plan.pdf)

6.4.3 Groundwater monitoring

Groundwater monitoring is currently conducted across 13 bores on a seasonal basis

The bores currently monitored;

Bore	Location	Reason
SW4MB01	Adjacent to point of compliance, Edith River	Downgradient; compliance point
BW29	Drainage to the Edith River	Downgradient
MB6S	Paired wells downgradient of RP1	Appear to have lowest quality water of wells around RP1. Sentry well for RP1
MB6D		
WDMB02	Down gradient of WRD	Sentry well for WRD
BW8	Down gradient of HLP	Sentry well for HLP
BPMB02	Down gradient of Batman Pit	Sentry well for Batman Pit
TDMB1S	Paired wells down gradient of TSF1	Monitoring change in water quality down gradient of TSF1.
TDMB1D		
TDMBS1	Paired wells cross gradient of TSF1	Monitoring change in water quality cross gradient of TSF1.
TDMBD1		
BW18	Furthest upgradient well	Evalaute background conditions entering site
TSF2MB02	Cross gradient	Vivinity of TSF2

The following physical parameters are measured –

- SWL
- pH
- Electrical Conductivity
- Turbidity
- Dissolved Oxygen
- Oxidation / Reduction
- Temperature

All samples are dispatched to the laboratory for the following analysis

Ammonia(N)
- Conductivity
- Cyanide (amenable)
- Cyanide (free)
- Cyanide (total)
- Cyanide (weak acid dissoc.)
- Nitrate (as N)
- Nitrite (as N)
- Phosphate total (P)
- Silica
- Sulphate (S)
- Total Dissolved Solids
- Total Kjeldahl Nitrogen (N)
- Calcium
- Magnesium
- Potassium
- Sodium
- Aluminium
- Aluminium (filtered)
- Antimony (filtered)
- Arsenic
- Arsenic (filtered)
- Barium (filtered)
- Beryllium (filtered)
- Bismuth (filtered)
- Boron (filtered)
- Cadmium
- Cadmium (filtered)
- Chromium (filtered)
- Cobalt
- Cobalt (filtered)
- Copper
- Copper (filtered)
- Iron
- Iron (filtered)
- Lead
- Lead (filtered)
- Lithium (filtered)
- Manganese
- Manganese (filtered)
- Mercury (filtered)
- Molybdenum (filtered)
- Nickel
- Nickel (filtered)
- Selenium (filtered)
- Silver (filtered)
- Strontium (filtered)
- Thallium (filtered)
- Thorium (filtered)*
- Tin (filtered)
- Titanium (filtered)
- Uranium (filtered)*
- Vanadium (filtered)
- Zinc
- Zinc (filtered)
- Bicarbonate Alkalinity-mg CaCO3/L
- Carbonate Alkalinity-mg CaCO3/L
- Chloride
- Nitrate (as N)
- Sulphate (S)
- Total Nitrogen (as N)
- Nitrate & Nitrite (N)
- Total Kjeldahl Nitrogen (N)
- Total Nitrogen (N)

Groundwater sampling and analysis is currently provided externally. Pumping and sampling of ground waters is conducted via a semi-automatic sampling system comparable in standard to that of the DME. While continuously monitoring the standing water level of the bore to minimise drawdown, groundwater is continuously pumped to the surface and passed through a flow cell where the physical parameters listed above are continuously measured. Flow rates typically are less than 1L/min and regulated to achieve sufficient flow without disturbing the build-up of settled sediments around the screened zone. When all of the physical parameters have stabilised and the water is determined to be adequately representative of the surrounding "aquifer", water is diverted to the pre preserved sample containers (via inline filtration if necessary) and immediately cooled prior to dispatch to the laboratory.

Assessment against guideline values is typically not undertaken as groundwater is not being extracted and actively discharged as part of the care and maintenance operations. However, parameter concentrations are generally assessed against seasonal variations and historic values to provide an indication of potential changes in water quality.

As outlined in section 6.3.4 the specifics of the above program may change to better address the groundwater monitoring needs of the site and company.

6.4.4 Sediment monitoring

Sediments are monitored as a requirement of the WDL and undertaken in conjunction with Macroinvertebrate sampling on an annual basis. The macroinvertebrate and sampling plan is available from the NTEPA website

(http://www.ntepa.nt.gov.au/__data/assets/pdf_file/0011/158357/WDL178_vista_gold_mt_todd_macro_sediment_plan.pdf)

Sediment samples are annually collected from the Edith River and Ferguson Rivers for comparative assessment. No other aquatic sediment monitoring is conducted, with the exception of sediments collected from Stow Creek during the EIS development. However extension of the sediment program to Stow Creek is likely over the forthcoming period to establish baseline data prior reestablishment of production onsite.

In 2013, the number of sediment sites was increased to fourteen along the Edith River in response to questions raised by results from previous years sampling. The three reference sites on the Ferguson River were kept consistent with previous years and only the type of sample adjusted to maintain similarity with the Edith River samples. At each site along the rivers, sediments were collected from the bottom of the river bed, and also from the wetted banks of the stream. Where possible benthic samples were collected with a ponar sampler via boat, or in inaccessible areas via the use of a collection scoop on a long pole. Bank substrate samples were collected form the wetted zone and in areas considered to be sediment sinks. The locations of the sediment sites are listed in Table 23 and illustrated in Figure 25

Table 23 - Sediment monitoring sites

Site Name	Easting	Northing	Description
ERSite_1_Centre	192048.881	8430984.979	Edith Site 1 Stream Bed
ERSite_1_Edge	192048.881	8430984.979	Edith Site 1 Stream Bank
ERSite_2_Centre	191068.454	8431667.971	Edith Site 2 Stream Bed
ERSite_2_Edge	191068.454	8431667.971	Edith Site 2 Stream Bank
ERSite_3_Centre	189809.016	8431547.882	Edith Site 3 Stream Bed
ERSite_3_Edge	189809.016	8431547.882	Edith Site 3 Stream Bank
ERSite_4_Centre	188585.167	8431424.402	Edith Site 4 Stream Bed
ERSite_4_Edge	188585.167	8431424.402	Edith Site 4 Stream Bank
ERSite_5_Centre	188270.96	8431536.59	Edith Site 5 Stream Bed
ERSite_5_Edge	188270.96	8431536.59	Edith Site 5 Stream Bank
ERSite_6_Centre	187681.122	8431380.897	Edith Site 6 Stream Bed
ERSite_6_Edge	187681.122	8431380.897	Edith Site 6 Stream Bank
ERSite_7_Centre	187422.853	8431374.821	Edith Site 7 Stream Bed
ERSite_7_Edge	187422.853	8431374.821	Edith Site 7 Stream Bank
ERSite_8_Centre	186817.754	8431428.892	Edith Site 8 Stream Bed
ERSite_8_Edge	186817.754	8431428.892	Edith Site 8 Stream Bank
ERSite_9_Centre	186190.363	8431641.694	Edith Site 9 Stream Bed
ERSite_9_Edge	186190.363	8431641.694	Edith Site 9 Stream Bank
ERSite_10_Centre	184903.613	8431318.249	Edith Site 10 Stream Bed
ERSite_10_Edge	184903.613	8431318.249	Edith Site 10 Stream Bank
ERsite_11_Centre	183350.899	8431732.375	Edith Site 11 Stream Bed
ERsite_11_Edge	183350.899	8431732.375	Edith Site 11 Stream Bank
ERsite_12_Centre	182142.736	8431577.99	Edith Site 12 Stream Bed
ERsite_12_Edge	182142.736	8431577.99	Edith Site 12 Stream Bank
ERSite_13_Centre	180404.5	8431123.68	Edith Site 13 Stream Bed

Site Name	Easting	Northing	Description
ERSite_13_Edge	180404.5	8431123.68	Edith Site 13 Stream Bank
ERSite_14_Centre	179338.97	8429777.61	Edith Site 14 Stream Bed
ERSite_14_Edge	179338.97	8429777.61	Edith Site 14 Stream Bank
FRSite_1_Centre	200248.389	8450685.516	Ferguson Site 1 Stream Bed
FRSite_1_Edge	200248.389	8450685.516	Ferguson Site 1 Stream Bank
FRSite_2_Centre	199741.656	8453125.506	Ferguson Site 2 Stream Bed
FRSite_2_Edge	199741.656	8453125.506	Ferguson Site 2 Stream Bank
FRSite_3_Centre	195063.261	8455176.308	Ferguson Site 3 Stream Bed
FRSite_3_Edge	195063.261	8455176.308	Ferguson Site 3 Stream Bank

Sediments are dispatched to the laboratory for the following analyses

- Precent moisture
- Particle size distribution
- pH (in 1:5 soil to water ratio)
- total organic carbon (combustion)
- Aluminium
- Arsenic
- Beryllium
- Cadmium
- Calcium
- Chloride
- Chromium
- Cobalt
- Copper
- Cyanide
- Iron
- Lanthanum
- Lead
- Magnesium
- Manganese
- Mercury
- Nickel
- Nitrate
- Nitrite
- Potassium
- Silver
- Sodium
- Sulphate
- Zinc
- Uranium

6.4.5 Biological monitoring

Macroinvertebrates are currently the only biological form of routine annual monitoring conducted as a requirement of the WDL and used as an indicator of aquatic environment health. Samples are collected from five sites along the Edith River and three along the Ferguson River. The Ferguson River sites are used for comparative purposes during analysis and have been continued from the original sampling program established by the DME during their operation of the site. At each site three pelagic (Macroinvertebrates living within pool bank habitat) replicates are taken from within approximately a 300m reach to account for any possible natural spatial variability and bolster the statistical assessment of any possible downstream impacts. As of 2012, benthic (macroinvertebrates living on the floor of the river) samples have also been collected at each site to provide a more comprehensive site assessment. Pelagic samples are collected as per AusRivAS standards and benthic samples collected by boat and via the use of a ponar sampler. The locations of the macroinvertebrate sampling sites are listed in Table 23 and are illustrated in Figure 25. Once collected all macroinvertebrates are pre-processed and preserved in the field prior to return to the laboratory for sorting and identification.

The macroinvertebrate monitoring program is reviewed on an annual basis and changes made that reflect our increase in knowledge following each monitoring event.

A vertebrate/fish survey was conducted in as part of the EIS development and Vista Gold are also committed a further fish assessment within the next 12 months in an effort to identify any risks to the community with respect to the consumption of fish recreationally caught from the Edith River. Additional specific aquatic biological assessments will also be commissioned following outcomes from the EIS if necessary.

It is unlikely that ongoing Fish Studies will form part of the environmental protection/monitoring philosophies going forward.

Table 24 - Macroinvertebrate sampling sites 2013

Site	Easting	Northing	Description
ERBTM_1	181760.073	8431555.45	Edith Pelagic Replicate 1
ERBTM_2	182310.79	8431541.345	Edith Pelagic Replicate 2
ERBTM_3	182510.395	8431513.291	Edith Pelagic Replicate 3
ERBTM_BEN	182108.787	8431588.083	Edith Benthic
ERDS_1	187648.521	8431387.249	Edith Pelagic Replicate 1
ERDS_2	187846.922	8431341.643	Edith Pelagic Replicate 2
ERDS_3	187484.836	8431377.803	Edith Pelagic Replicate 3
ERDS_BEN	187799.94	8431331.86	Edith Benthic
ERSW4_1	186060.297	8431630.775	Edith Pelagic Replicate 1
ERSW4_2	186522.794	8431592.89	Edith Pelagic Replicate 2
ERSW4_3	186980.702	8431323.607	Edith Pelagic Replicate 3
ERSW4_BEN	186119.641	8431628.855	Edith Benthic
ERTOP_1	191619.677	8431201.761	Edith Pelagic Replicate 1
ERTOP_2	192218.568	8430864.909	Edith Pelagic Replicate 2
ERTOP_3	192423.61	8430636.307	Edith Pelagic Replicate 3
ERTOP_BEN	192065.064	8430986.837	Edith Benthic
ERUS_1	188643.134	8431411.275	Edith Pelagic Replicate 1
ERUS_2	188811.347	8431412.685	Edith Pelagic Replicate 2
ERUS_3	188395.225	8431520.061	Edith Pelagic Replicate 3
ERUS_BEN	188585.167	8431424.402	Edith Benthic
FRDS_3	199770.381	8453506.961	Ferguson Benthic
FRDS_1	199792.049	8452922.251	Ferguson Pelagic Replicate 1
FRDS_2	199739.65	8452983.089	Ferguson Pelagic Replicate 2
FRUS_1	200351.672	8450535.475	Ferguson Pelagic Replicate 1
FRUS_2	200260.285	8450648.451	Ferguson Pelagic Replicate 2
FRUS_3	200185.813	8451079.962	Ferguson Benthic
FRUS_BEN	200248.389	8450685.516	Ferguson Benthic
FRDS_BEN	199731.746	8453020.865	Ferguson Benthic
FRBTM_1	195146.754	8455257.58	Ferguson Pelagic Replicate 1
FRBTM_2	195427.296	8455520.02	Ferguson Pelagic Replicate 2
FRBTM_3	195642.342	8455569.965	Ferguson Pelagic Replicate 3
FRBTM_BEN	195063.261	8455176.308	Ferguson Benthic

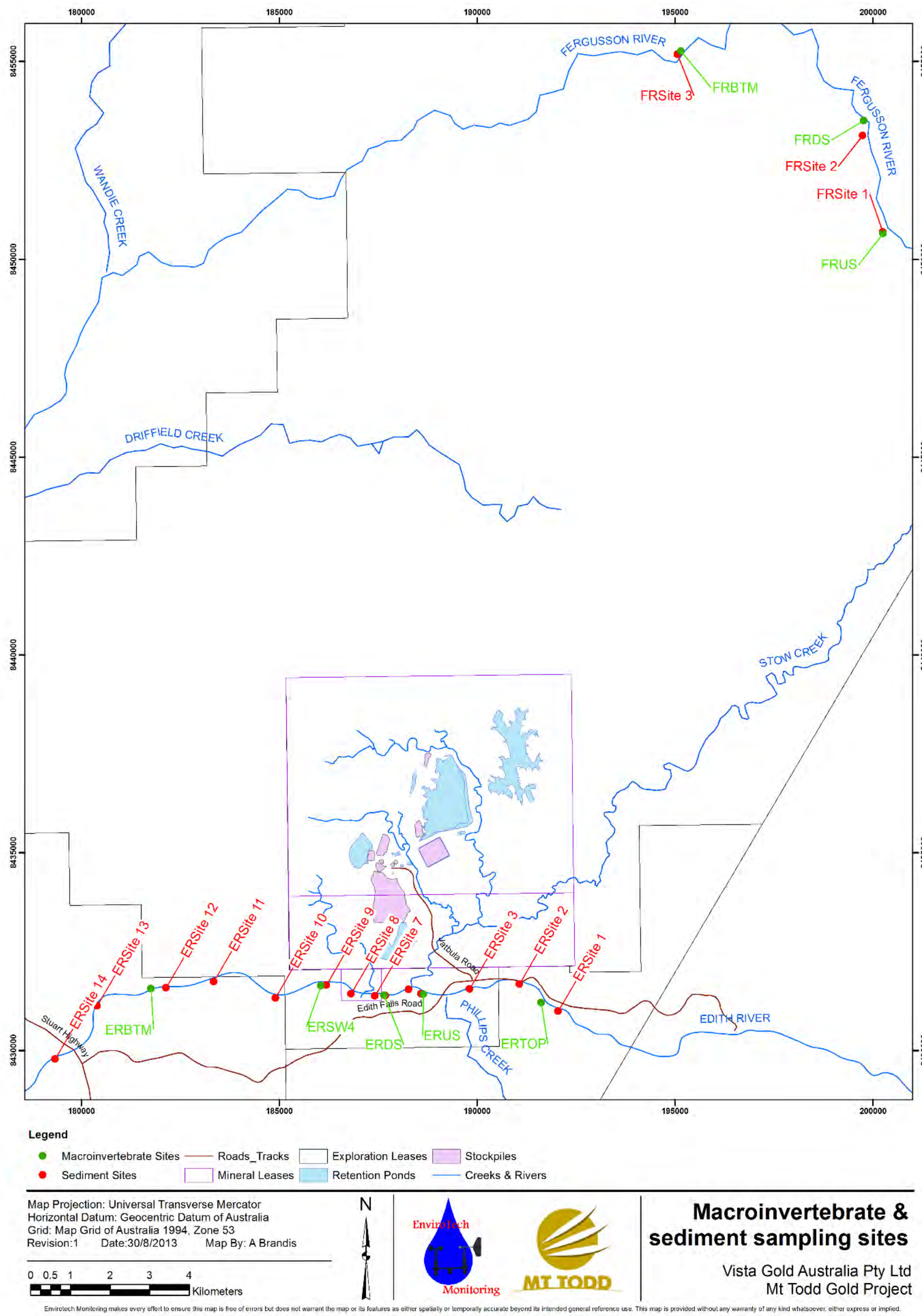


Figure 25 - Macroinvertebrate and sediment sampling sites in 2013

6.4.6 Sampling quality control and methodology

All sampling programs are conducted to a minimum of Australian standards or procedures relevant to the monitoring program (e.g. AUSRIVAS).

Instruments used for reading water quality physical parameters are calibrated prior to each day of sampling and follow procedures as listed by the relevant instrument manufacturer's manual. Quality control procedures for instruments include:

- Keeping pH and dissolved oxygen sensors moist when stored
- Referencing barometric pressure readings from the site weather station during the calibration of dissolved oxygen meters
- Documenting calibration results to verify instrument performance
- Calibrating EC and pH sensors using standards appropriate for the waters to be sampled

Field QA and QC requirements are managed through the Procedure for the sampling of Surface Waters, Department of Resources Advisory Note #: AA7-025 March 2009 and the respective Australian/New Zealand Standards:

- 5667.1:1998 Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
- 5667.4:1998 Part 4: Guidance on sampling from lakes, natural and man-made.
- 5667.6:1998 Part 6: Guidance on sampling of rivers and streams.
- 5667.11:1998 Part 11 Guidance on sampling of ground waters.

Vista Gold's contracted laboratory has a large NATA scope of accreditation to AS ISO/IEC 17025, the terms of which can be viewed at http://www.nata.asn.au, (Accreditation number 2901). This includes all aspects of the analytical process including sample preservation, sample registration, methodology, instrument calibration and maintenance, data records, calculations and reporting of results. Where not accredited, these tests are subcontracted to a NATA Accredited laboratory where applicable.

All sample containers are supplied pre dosed with preservative (where required) by the laboratory. Where possible, sample containers and chain of custody forms are pre labelled to minimise recording and documenting errors in the field. Field filtering (0.45 μm) is performed onsite when required using sterile filters and syringes of brands known to be suitable for water quality chemical sampling. All samples are stored in the site sample refrigerator until they can be dispatched in chilled eskies. Chain of custody forms, samples and blanks are collected by a Katherine to Darwin couriers for immediate transport to the laboratory. Electronically received results are compiled and assessed by the Environmental Manager.

6.4.7 Level of protection

The following environmental protection objectives and beneficial use declarations are relevant to water management at the site

- Declared Water Quality Objective for the Edith River Surface Water: Aquatic Ecosystem Protection (Gazette Reference G23 11 June 1997)
- Groundwater Declared Area: Katherine Region Groundwater Declared Area (Gazette Reference G22 9 June 1999)

While not directly related to water management operations, the following sites of conservation significance (SOCS) are applicable to the region in general:

- SOCS Number 30, Yinberrie Hills

- SOCS Number 3, Daly River Middle Reaches

6.4.7.1 Surface water trigger values

WDL 178-3 permits the discharge of wastewaters via the application of direct toxicity assessment (DTA) and subsequent calculation of applicable dilution rates. To accompany the dilution ratios monitoring values (Table 25) are established which provide validation of the dilution ratios and a feedback mechanism to correct discharge ratios if necessary. DTA's were conducted for the RP1 and RP7 ponds in 2012 and results indicate untreated dilution ratios of 1:1000 and 1:4545 are respectively required. DTA tests for treated RP3 waters as at March 2013 currently specify a dilution ratio of 1:20. Further DTAs will be undertaken prior to the onset of the 2013-14 and subsequent wet seasons. The dilution ratios calculated are for the licenced 80% species protection at SW4. Figure 26 illustrates the decision and management process to be undertaken in the event of an exceedance, where an exceedance is defined as:

- A Monitoring Value (as listed in Table 25) concentration exceeding the rolling seven day 80th percentile for that Monitoring Value; (NOTE: the 80th percentile was selected as it is not possible to calculate a 90th or 95th percentile from a data set of seven points).
- During the first week of discharge, prior to obtaining seven data points for each Monitoring Value, each daily data point exceedance is investigated as per Figure 1; or
- Exceedence of an 80th percentile of the Monitoring Value during a single discharge event (less than 7 days).

Further detailed information on the planned management of discharges, sampling and assessment against trigger values is presented in in the Discharge Plan

All discharging activities will cease when results of sampled waters exceeded monitoring values by a factor of two or more.

Table 25 - Current monitoring values at SW4

Discharge	Chemical	Concentration (µg/L) 0.45 µm Filtered
RP3	Cu	2.5
	Zn	31
RP1 Untreated	Cu	4.3
RP7 Untreated	Cu	4.2

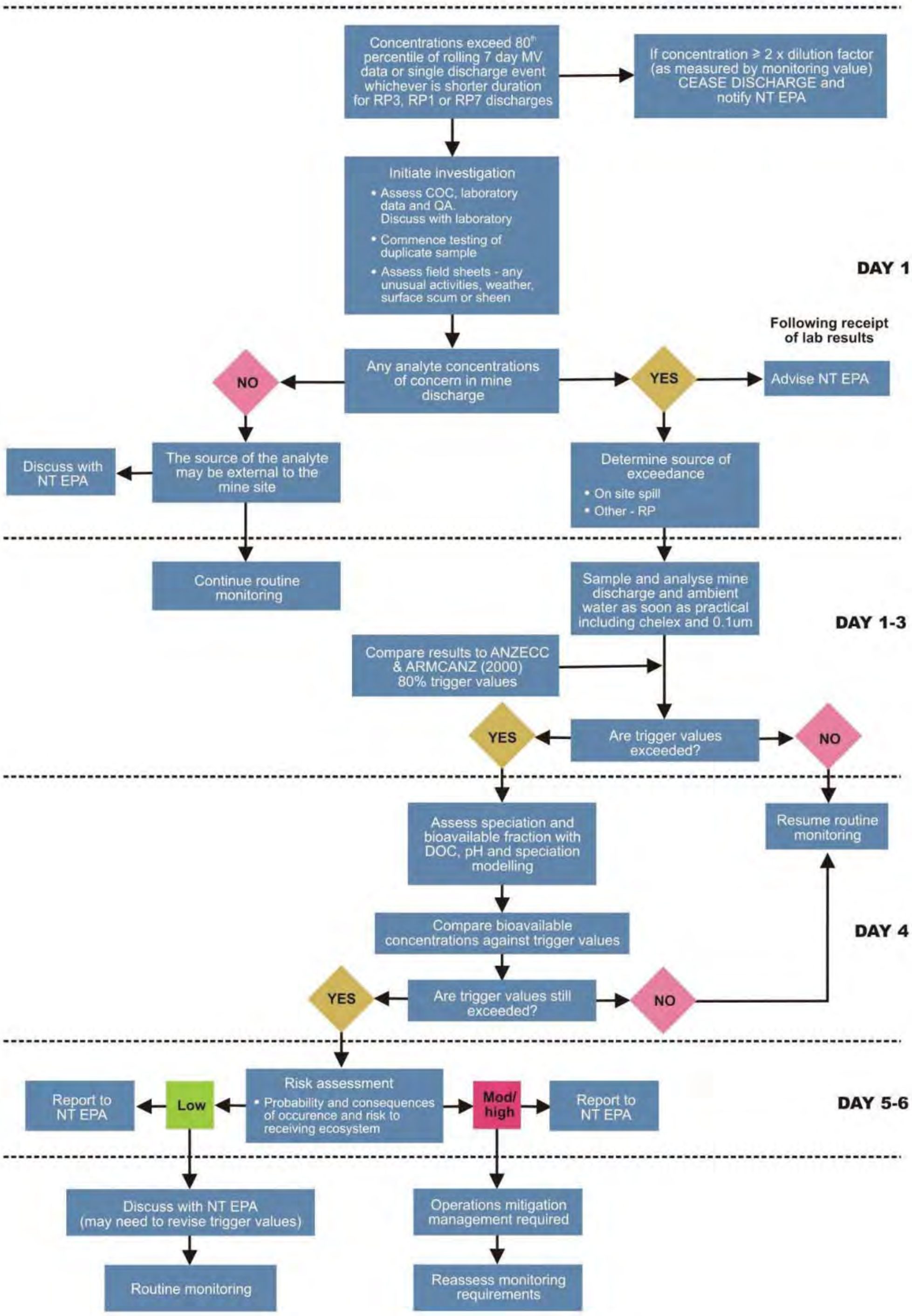


Figure 26 - Investigation process for exceedance of dilution factors

6.4.7.2 Groundwater trigger values

No trigger values are currently defined for groundwater sampling results.

6.5 Water Quality Reporting

6.5.1 Surface waters 2012-13

6.5.1.1 Discharge activities

The requirement for reporting under WDL 178-3 is listed as follows

- Monthly reports (for months when discharge has occurred), encompassing
  - The factors used to assess the dilution factor at SW4
  - Surface water monitoring results
  - Comparison of results against monitoring values at SW4
  - Comparison of results against Australian Drinking Water Guidelines (ADWG) for SW2 and SW10
- Annual Audit and Compliance Report (AACR)
- Annual Monitoring Report
- Licence Report, encompassing
  - Outcomes associated with ongoing studies

During the 2012-13 wet season discharge from site occurred on three separate occasions. Once during the uncontrolled discharge event as outlined in section 6.2.3, and the other two via controlled discharge from RP3 and RP1. Total discharge duration was less than 5 days and a total of six discharge related sampling events took place at monitoring locations SW2, SW3, SW4 and SW10. The quality of water samples taken at SW2, SW3, SW4 and SW10 throughout the 2012-13 period is summarised below.

6.5.1.1.1 Physical quality

pH

The pH recorded ranged from 5.19 to 7.67 across the four sampling locations (SW2, SW3, SW4 and SW10) as illustrated in Figure 27. No significant effects are evident, over the seasonal reduction in pH from rainfall, from the uncontrolled discharge event in February or from the controlled releases in March and April.

Electrical conductivity

EC fluctuated from lows of 9.9 to a high of 367 μS/cm at SW3, but on average generally below 50 for SW2, SW4 and SW10. A number of readings were significantly high at SW3 over the wet season, which is consistent with previous years and is expected to be due to the inflows of RP7 seepage from Horseshoe Creek. The EC results also do not exhibit any evidence of significant impact to the waters at SW4 and beyond from previous years activities.

Dissolved oxygen

Dissolved oxygen levels range from 3.32 to 7.91 mg/L across the four sites. The low readings under 5 mg/L are suspected to be due to instrument error and not a correct representation of aquatic conditions. The majority of other readings were above the 5 mg/L lower limit recognised in literature as required for aquatic life.

Temperature

The seasonal fluctuation of temperature within the Edith and Stow Creeks shows a greater range of movement than any specific discharge event.

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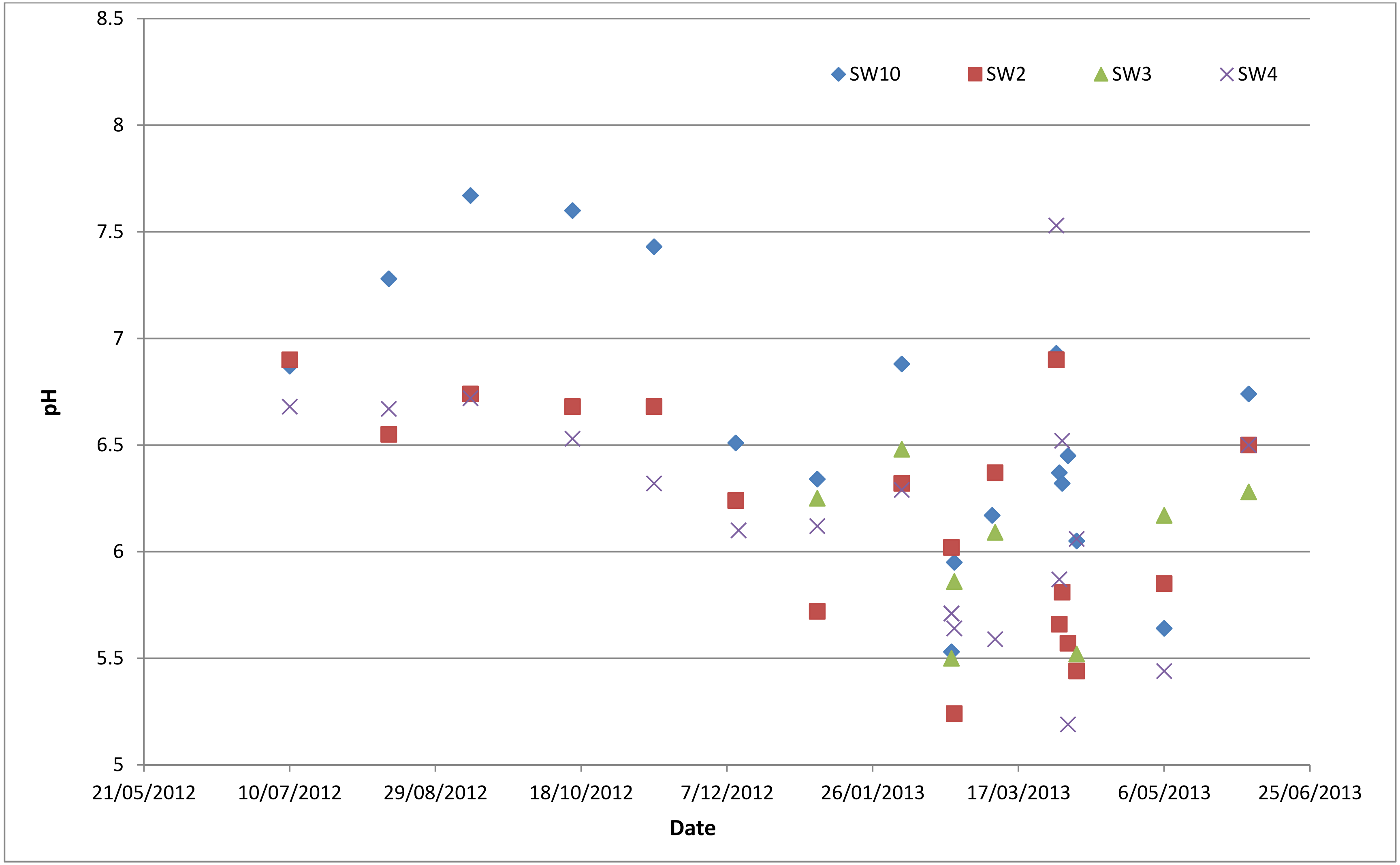

Figure 27- pH Concentrations at SW2, SW3, SW4 and SW10

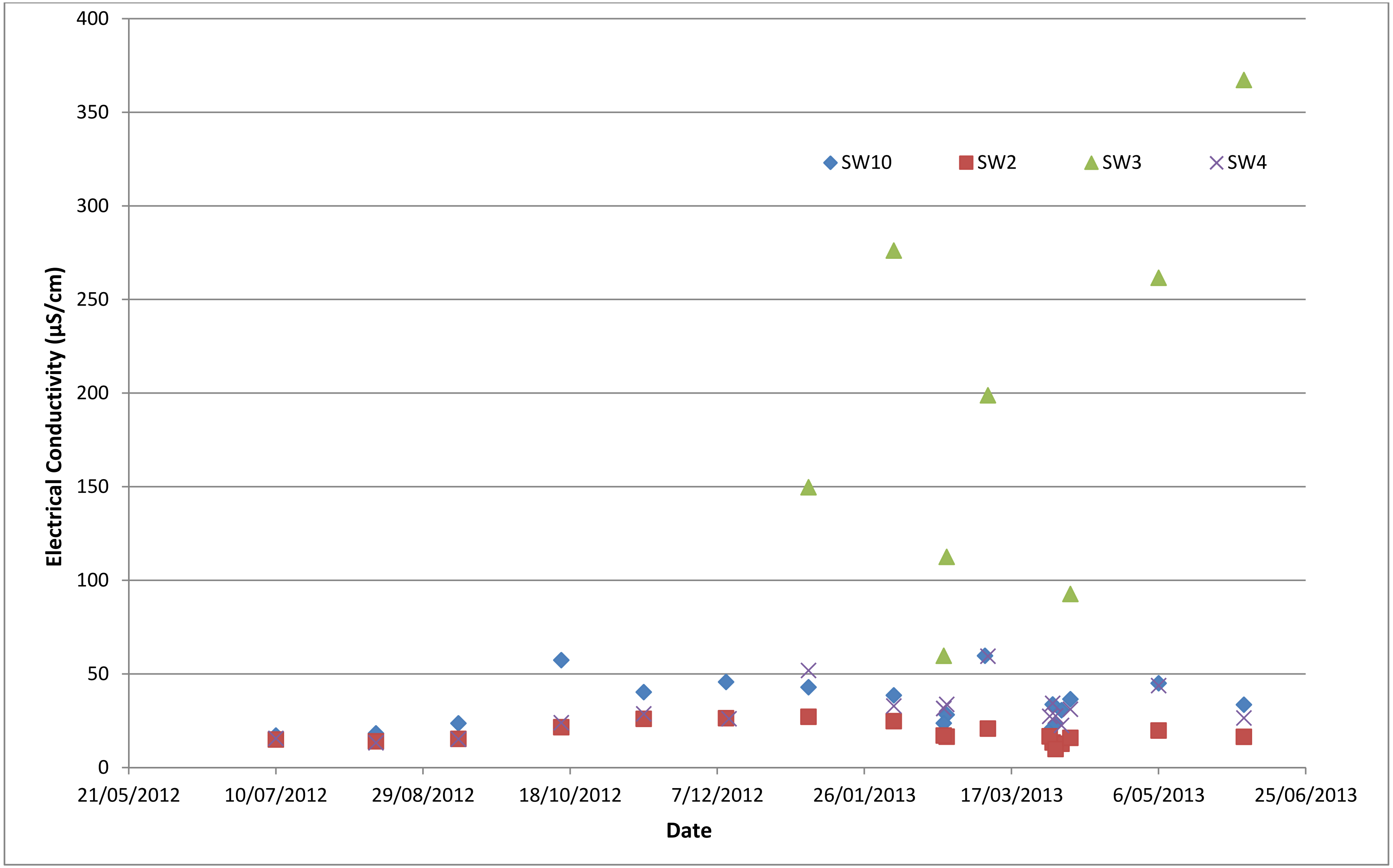

Figure 28 - Electrical Conductivity (Field Recorded) at SW2, SW3, SW4 and SW10

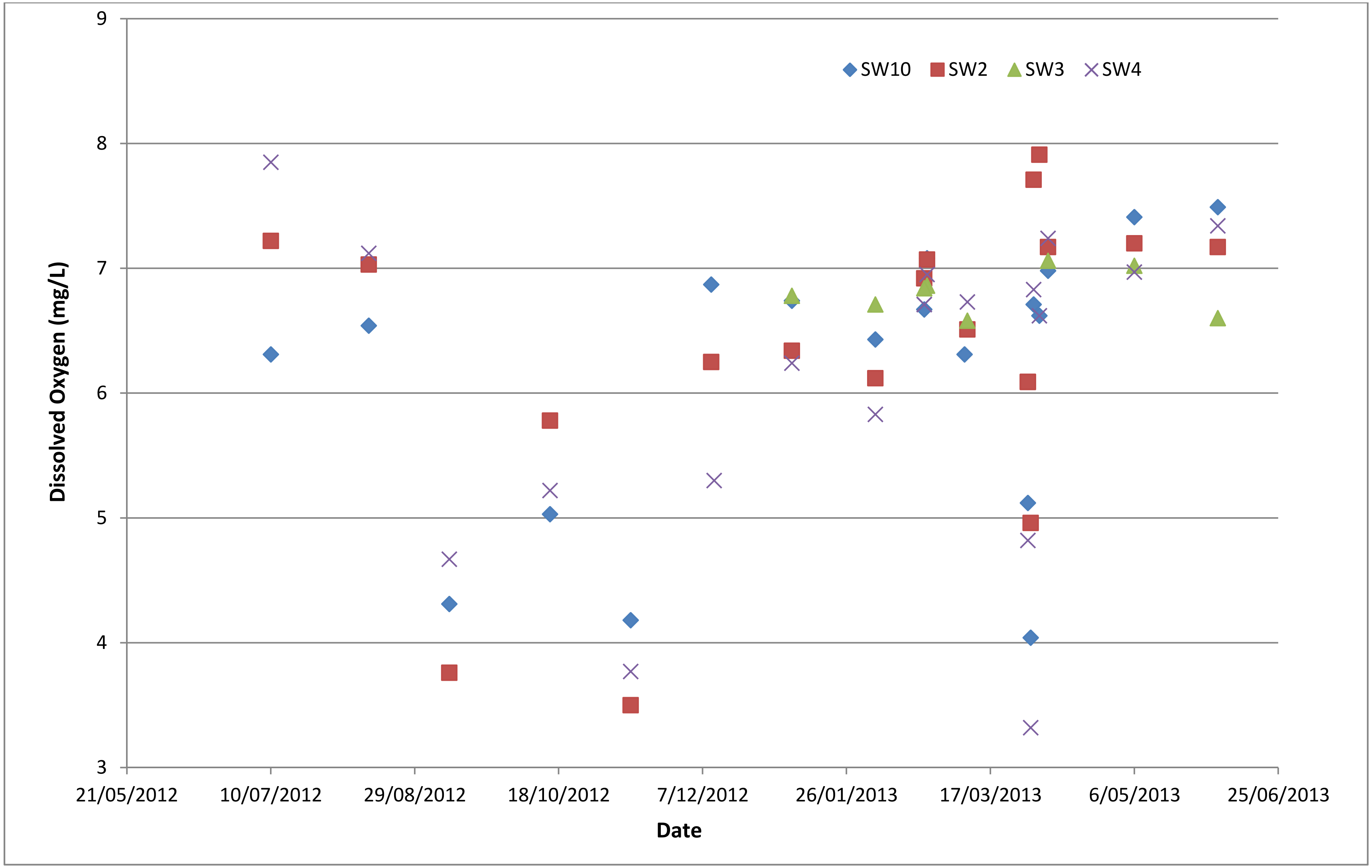

Figure 29 – Dissolved Oxygen at SW2, SW3, SW4 and SW10

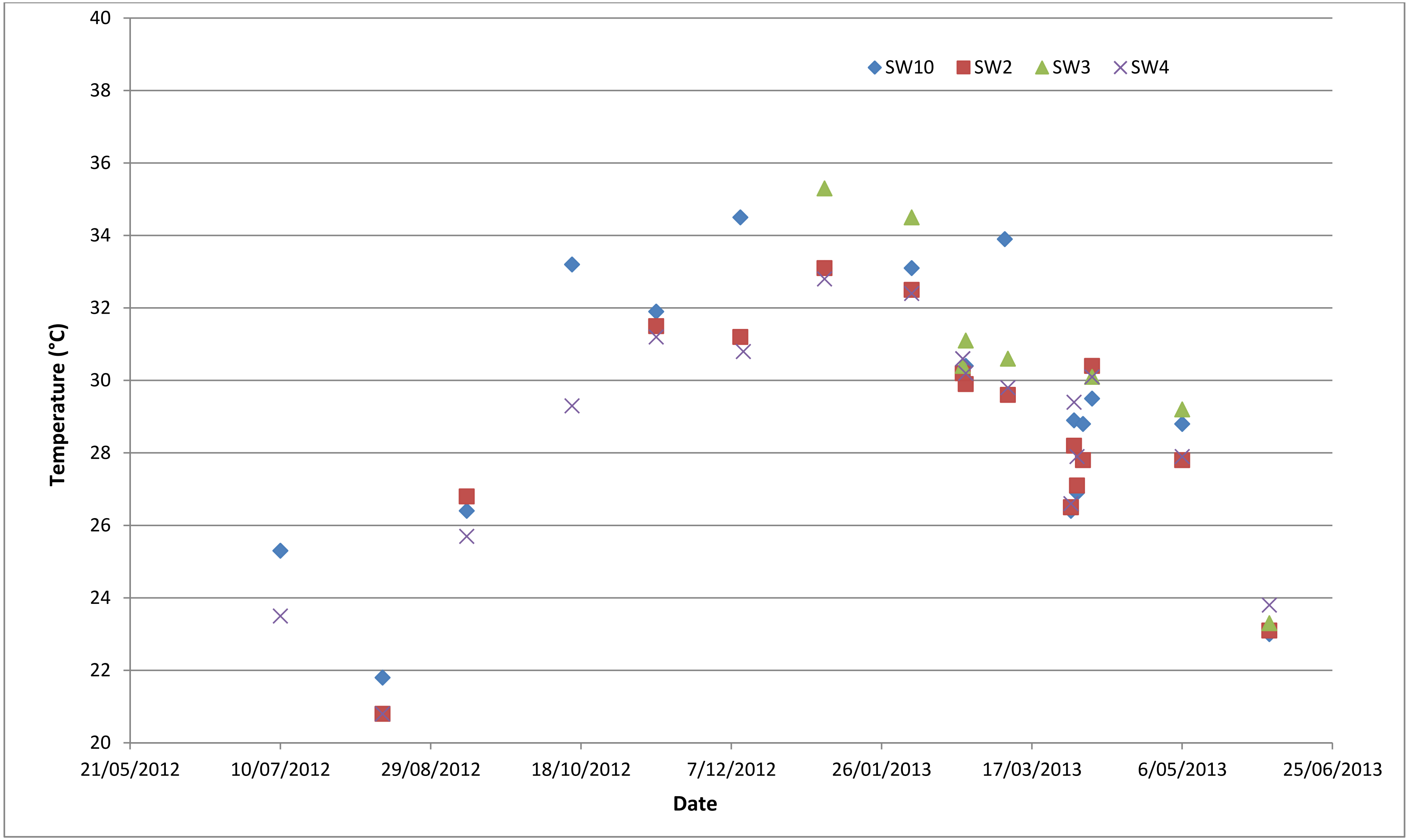

Figure 30 – Water temperature at SW2, SW3, SW4 and SW10

6.5.1.1.2 Chemical quality

Figure 31 through Figure 42 provide a graphical representation of the chemical results for the monitoring sites SW2, SW3, SW4, and SW10 and provide a measure on the chemical quality of the Edith River and Stow Creek at those localities.

Aluminium

Levels of aluminium were greatest during two offsite controlled and uncontrolled discharges. On the 30/3/2013 during discharge from RP3 levels peaked at the maximum value for the period of 640 µg/L. However the total Aluminium measured below the mine was not solely as a result of discharging. It is already know the upper Edith River catchment contains a high natural Aluminium content and during discharge total Aluminium concentrations were due to over 50% contribution from the Edith River.

Cadmium

A spike of cadmium was detected on the 6/4/2013 during routine monthly sampling. No discharging was occurring this period, and there were no known onsite operations which could have resulted in the spike. Given all four sites reported the high values, and no other sampling throughout the year produced equivalent results, it is suspect that the spike was due to sampling contamination.

Chromium

All chromium results were below laboratory detection limit.

Cobalt

Slightly elevated cobalt was recorded at SW3 on four occasions through the period. All other results were below detection limit.

Copper

All copper results attributable to the Mt Todd Site were less than 10 µg/L which is a significant improvement on historical discharge concentrations. Significantly high copper results were obtained at SW10 between 30/3/2013 and 3/4/2013 and are due to the remnants of the train derailment in 2011 as the equivalent SW4 readings isolate Mt Todd as the origin. It is suspected that the elevated level of the river over this period resulted in contact with remnant copper residing on the upper stream banks as the higher concentrations are not present at the lower flows. The lower monitoring value of 2.4 µg/L (applicable to RP3 discharge only) is also provided in Figure 35 as a comparison.

Iron

In general there were no significant effects on iron concentrations from discharging activities. Levels were elevated at SW4 during RP3 discharge on the 30/3/2013 but had reduced by SW10 and may possibly be due to absorption onto larger particles leading to the reduction of dissolved fractions.

Lead

All results were below laboratory detection limits.

Magnesium

Magnesium levels were generally higher at SW10 and SW4 compared to SW2 throughout the year with maximum concentrations in the Edith River being no higher than 2.6 µg/L. Stow creek exhibited elevated concentrations over the wet season.

Manganese

Overall concentrations were higher for Manganese results, but they showed a similar pattern to Magnesium throughout the year.

Mercury

All mercury results were at or very close to the laboratory detection limits. The spike on the 13/8/2012 is suspects to be from sample contamination due to its high value and occurrence at all sites measured.

Nickel

Nearly all nickel results were below the standard laboratory detection limit at SW10, SW2 and SW4, with higher concentrations only being detected at SW3 during the wet season.

Zinc

The majority of zinc results were below the 8 µg/L monitoring value determined for RP3 discharges. Two very high results were recorded for SW2during late dry / early wet season, but it is known if these are due to sampling contamination or some form of localised contamination from the roadway. Higher concentrations were recorded for the RP5/RP5 discharge but the absolute numbers are well below those equivalents from historical discharging. On high reading was recorded at SW4 on the 6/4/2013 and is of unknown origin or explanation.

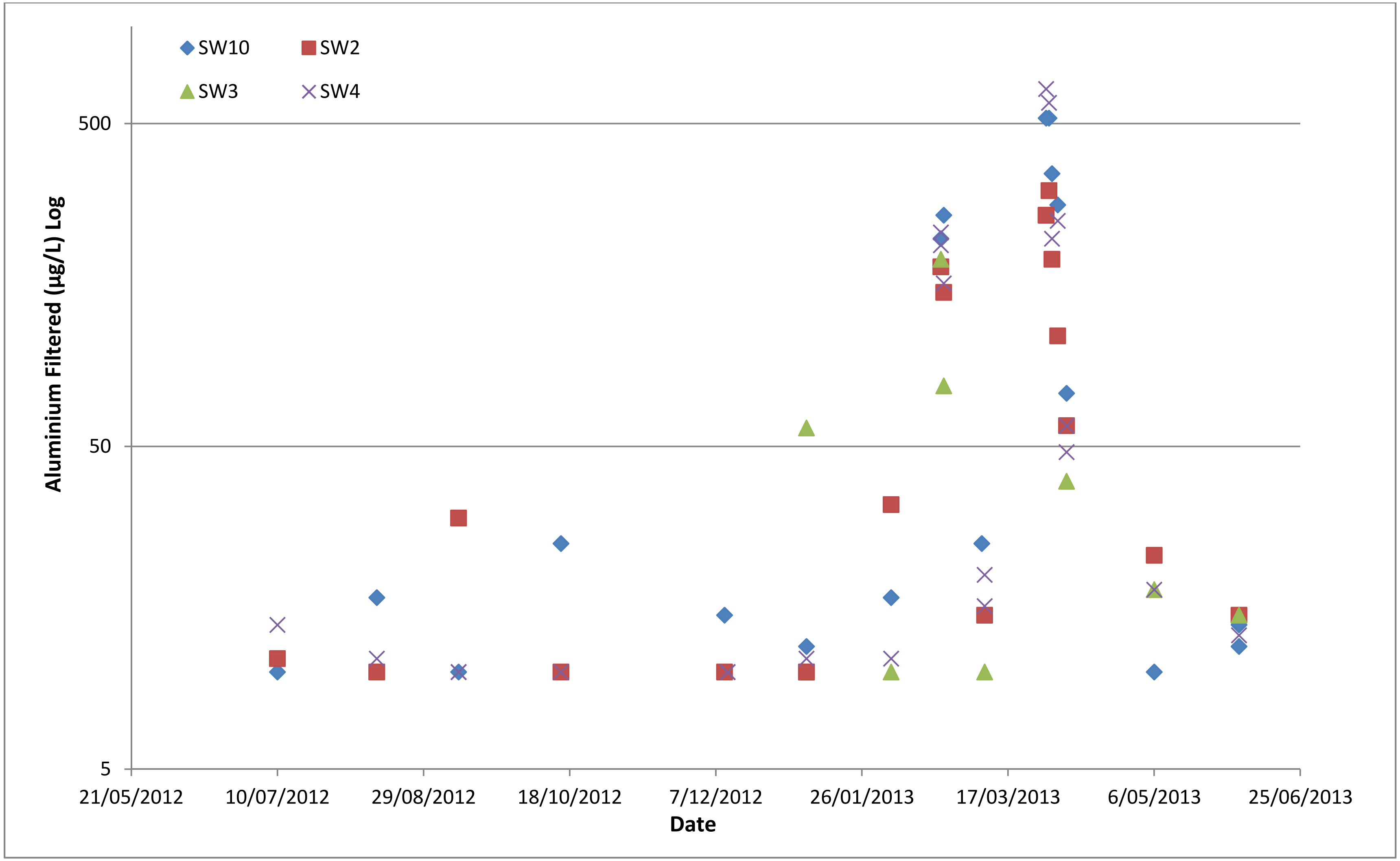

Figure 31 - 0.45µm Filtered Aluminium Concentrations at SW2, SW3, SW4 and SW10

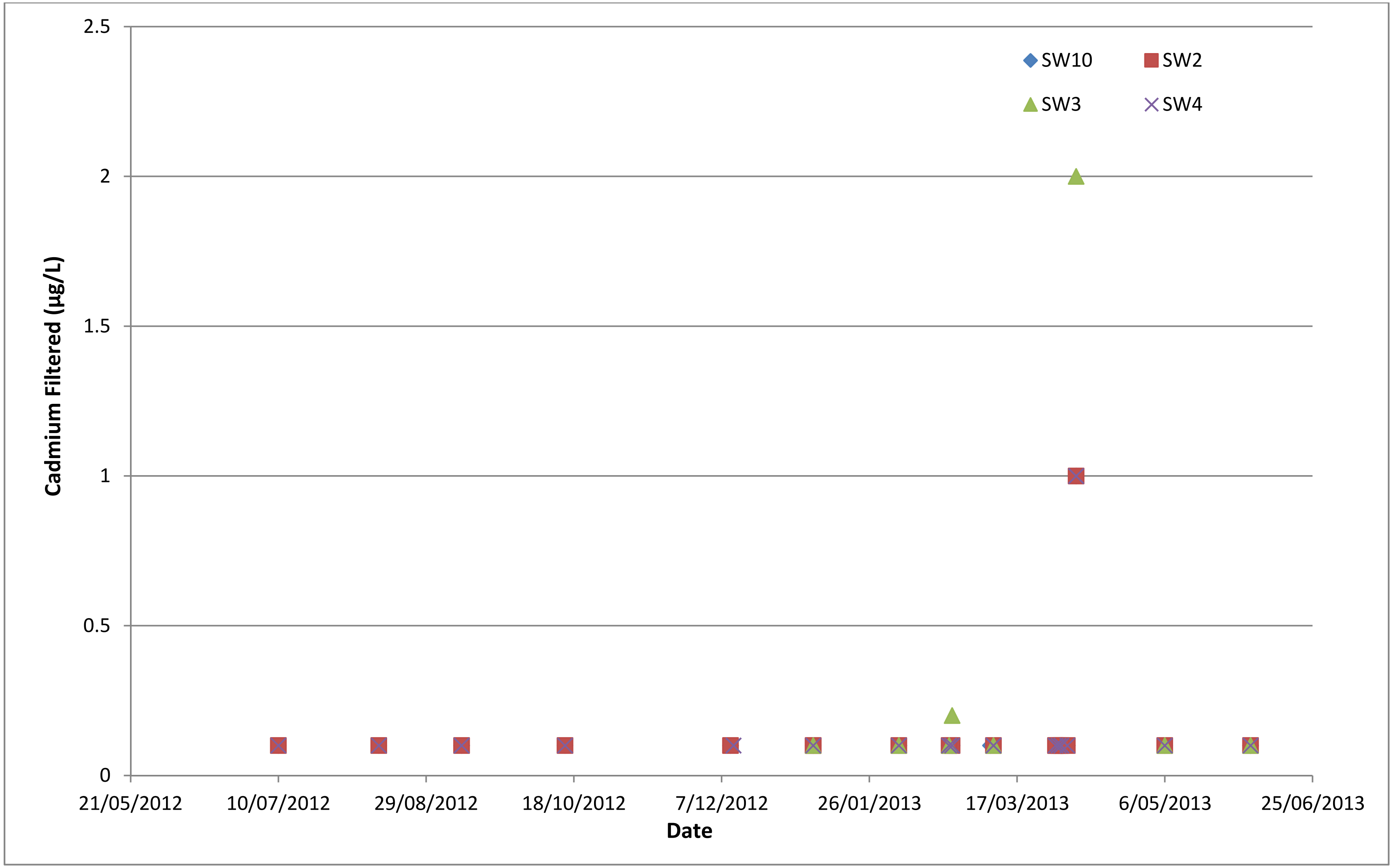

Figure 32 - 0.45µm Filtered Cadmium Concentrations at SW2, SW3, SW4 and SW10

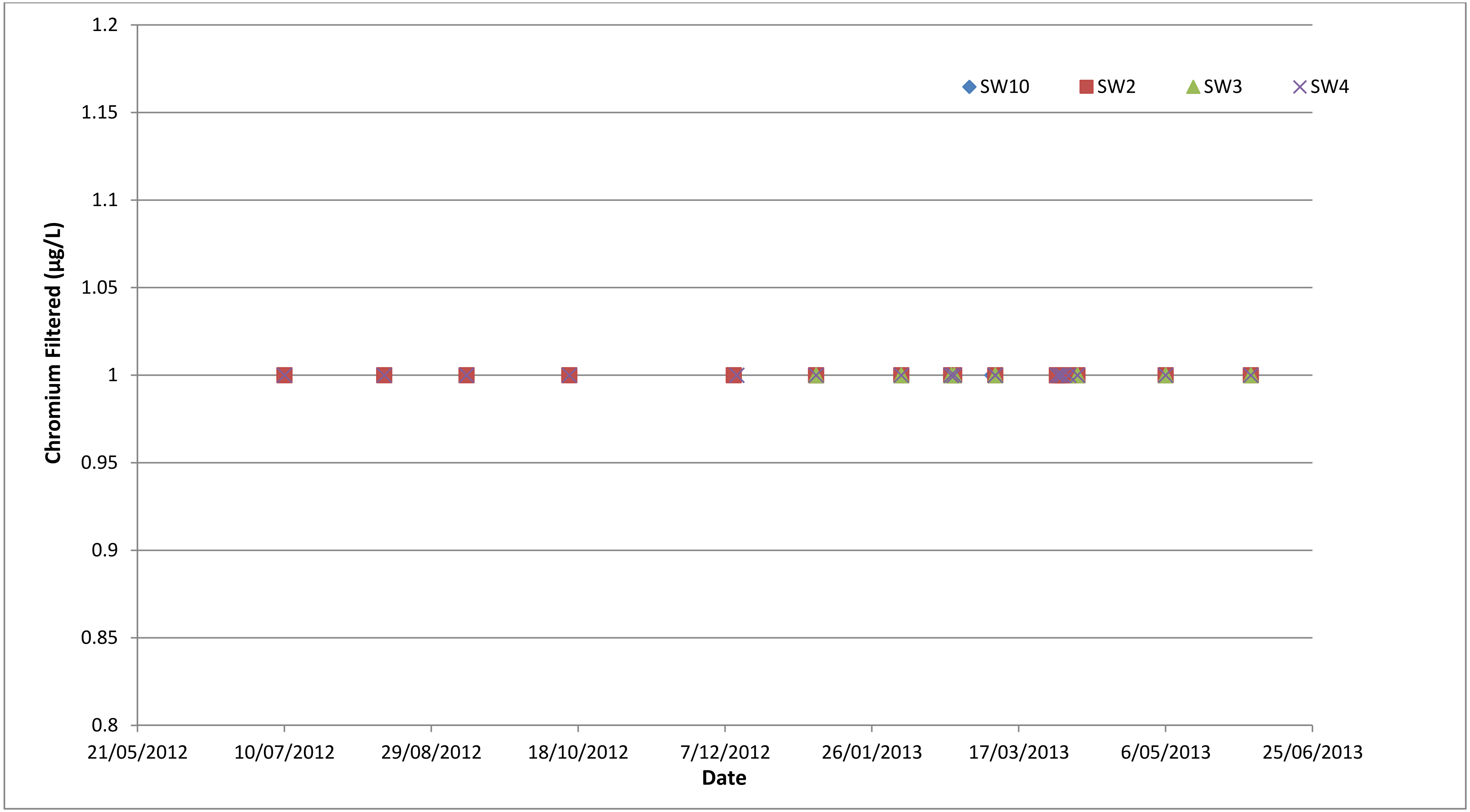

Figure 33 - 0.45µm Filtered Chromium Concentrations at SW2, SW3, SW4 and SW10

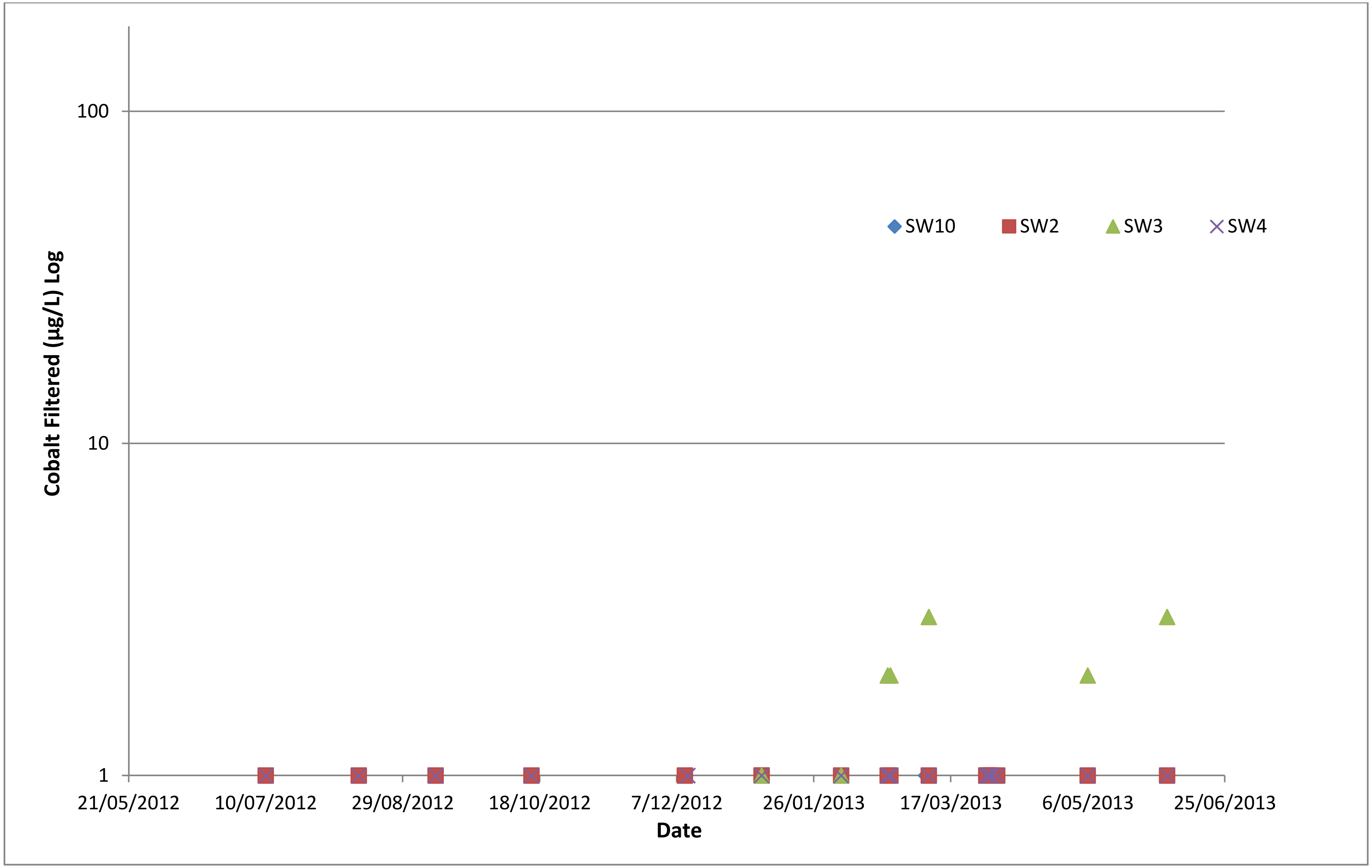

Figure 34 - 0.45µm Filtered Cobalt Concentrations at SW2, SW3, SW4 and SW10

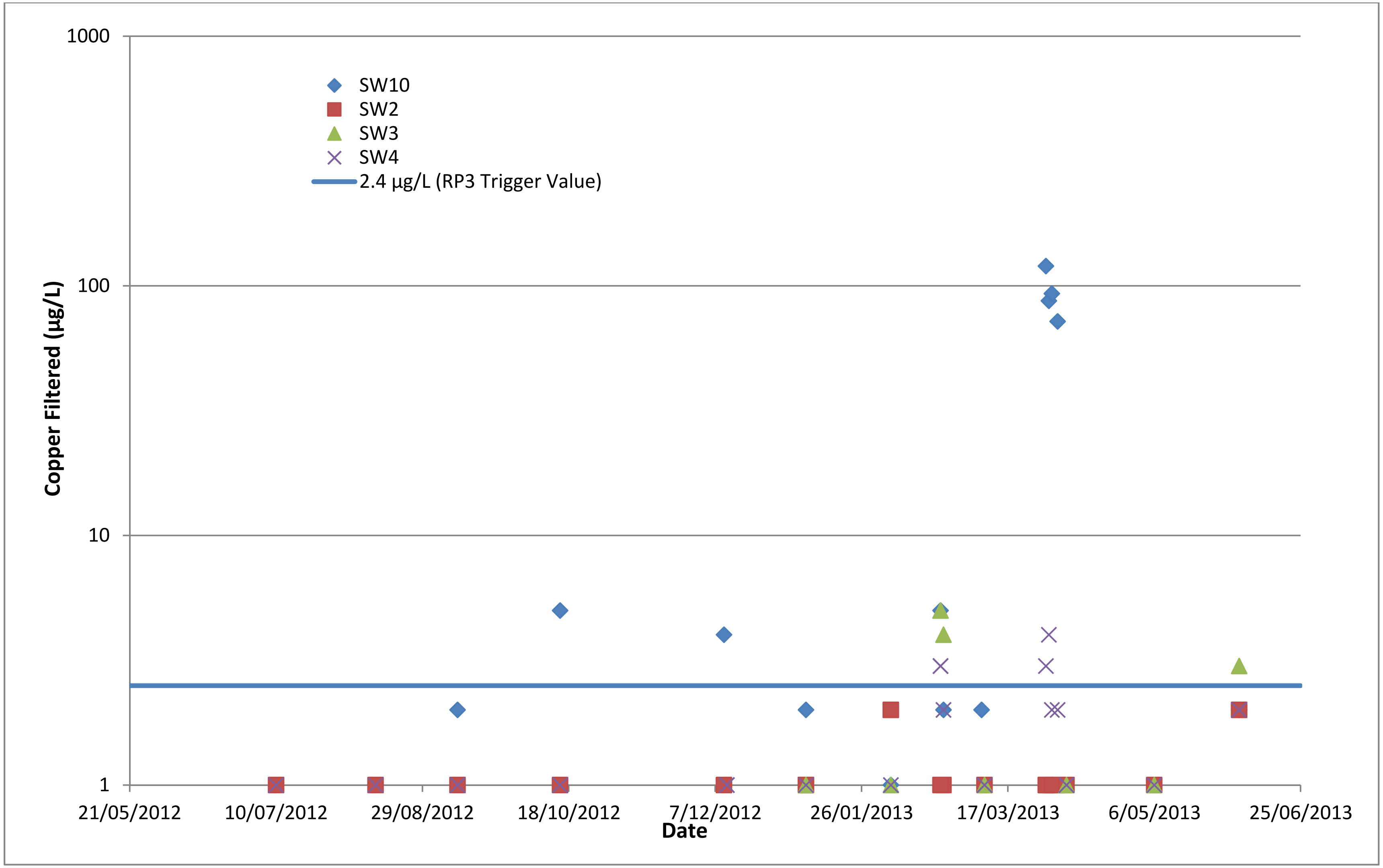

Figure 35 - 0.45µm Filtered Copper Concentrations at SW2, SW3, SW4 and SW10

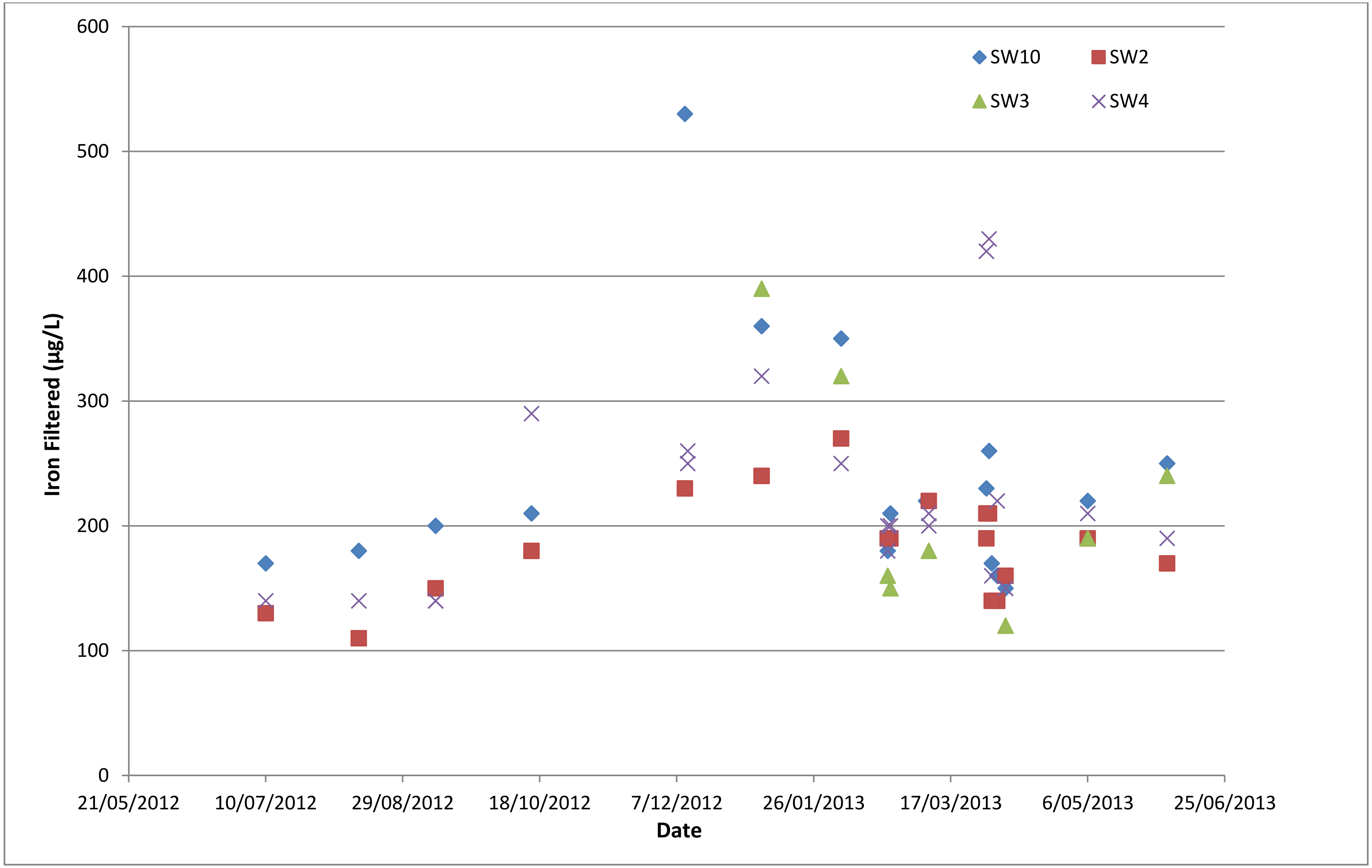

Figure 36 - 0.45µm Filtered Iron Concentrations at SW2, SW3, SW4 and SW10

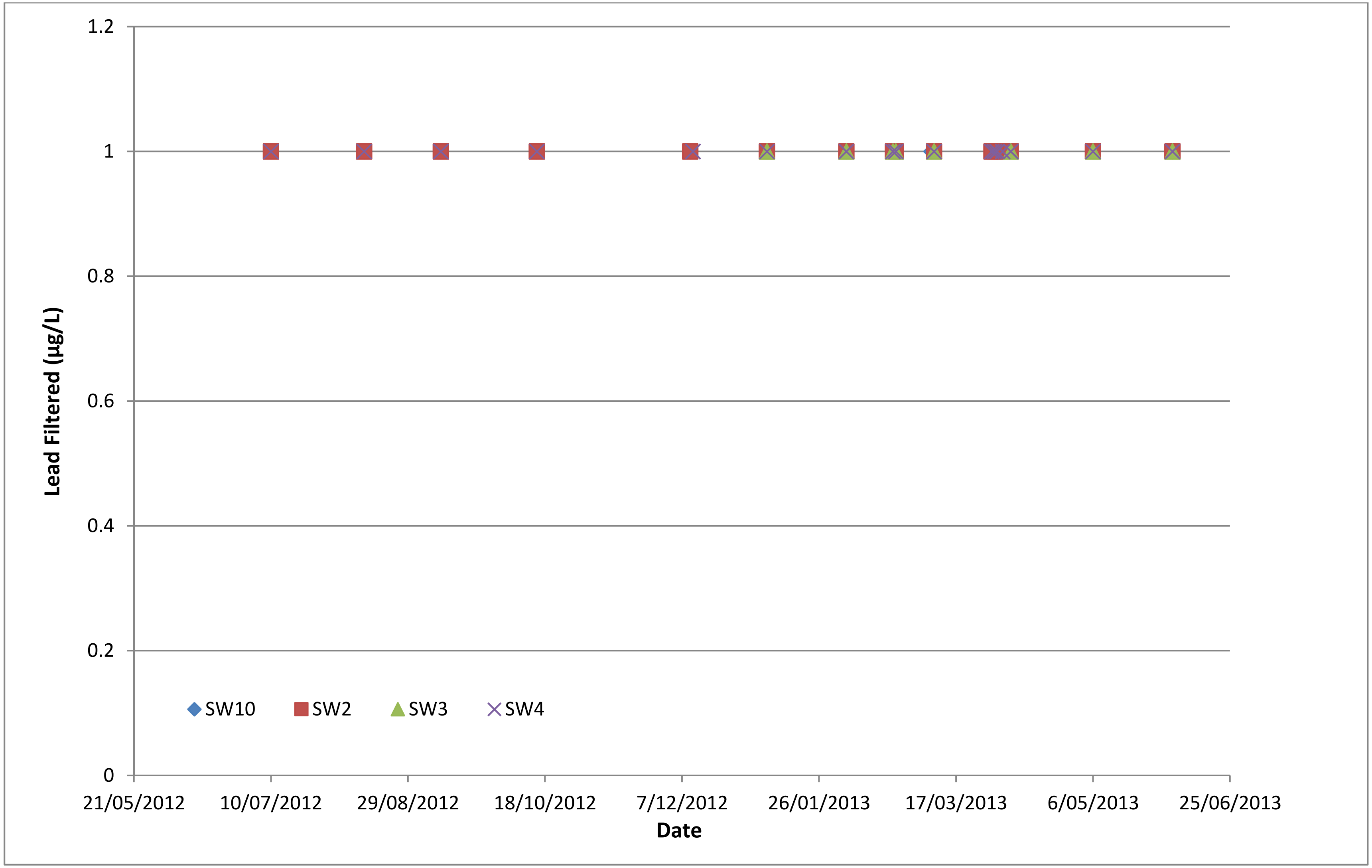

Figure 37 - 0.45µm Filtered Lead Concentrations at SW2, SW3, SW4 and SW10

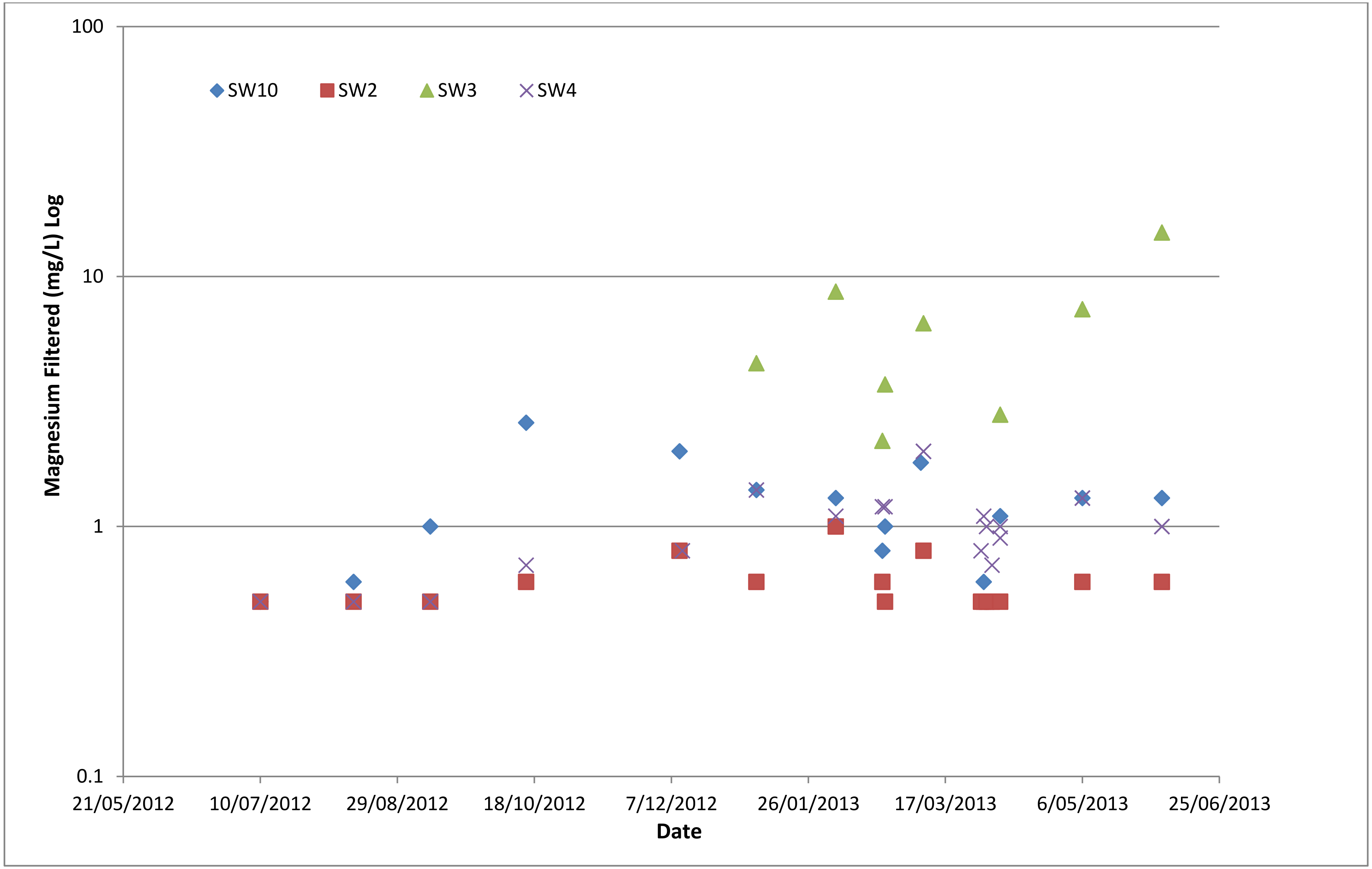

Figure 38 - 0.45µm Filtered Magnesium Concentrations at SW2, SW3, SW4 and SW10

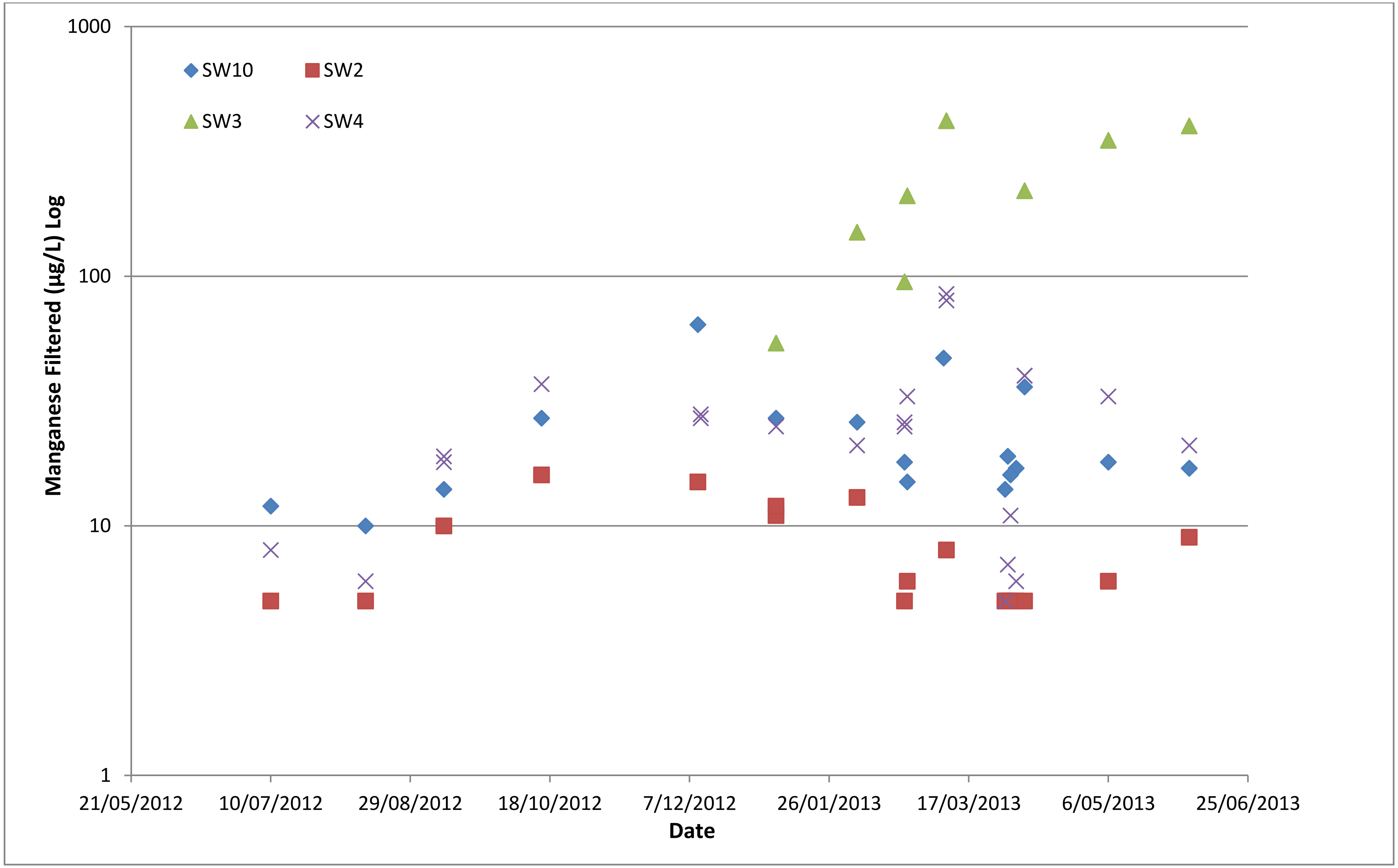

Figure 39 - 0.45µm Filtered Manganese Concentrations at SW2, SW3, SW4 and SW10

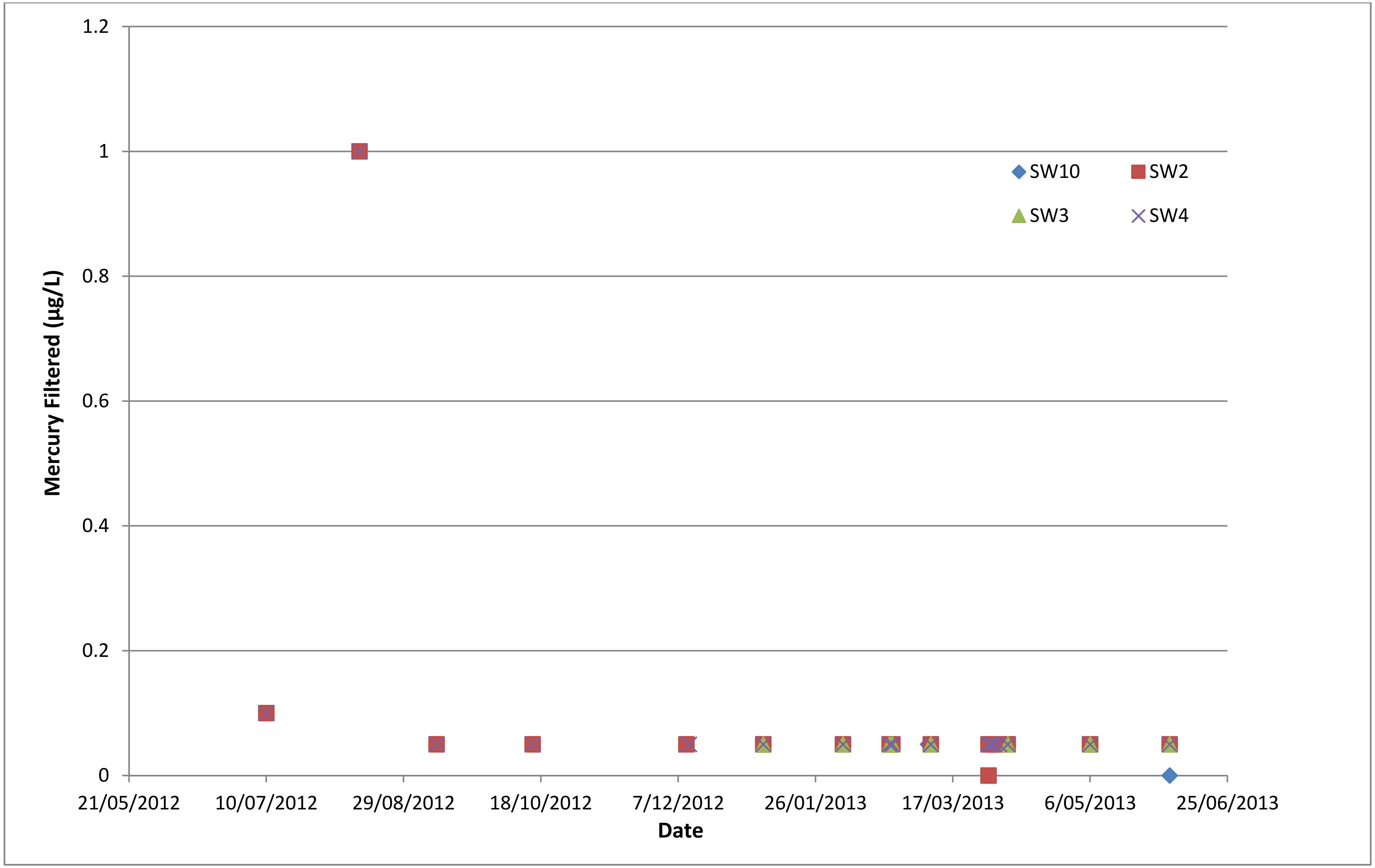

Figure 40 - 0.45µm Filtered Mercury Concentrations at SW2, SW3, SW4 and SW10

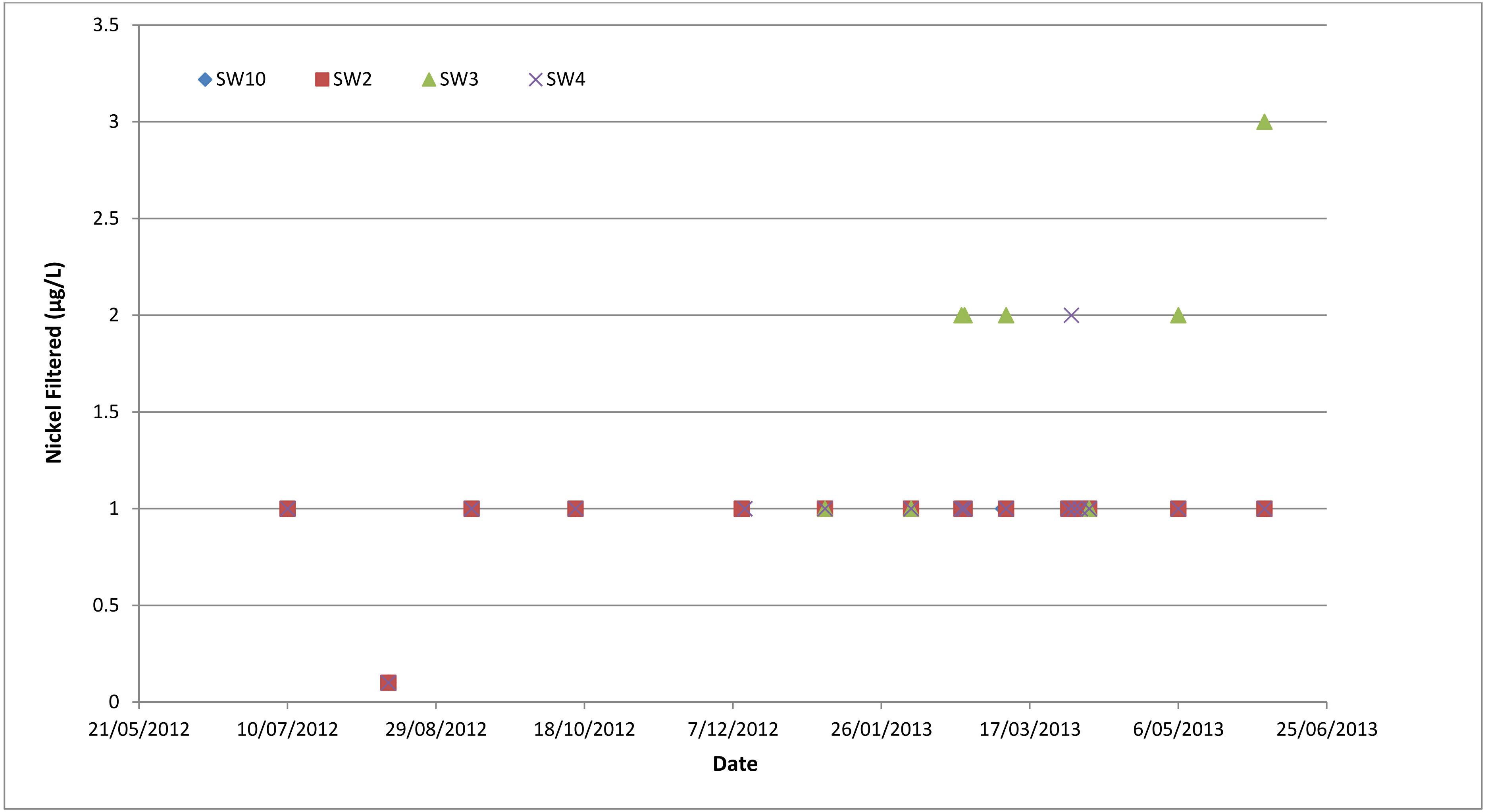

Figure 41 - 0.45µm Filtered Nickel Concentrations at SW2, SW3, SW4 and SW10

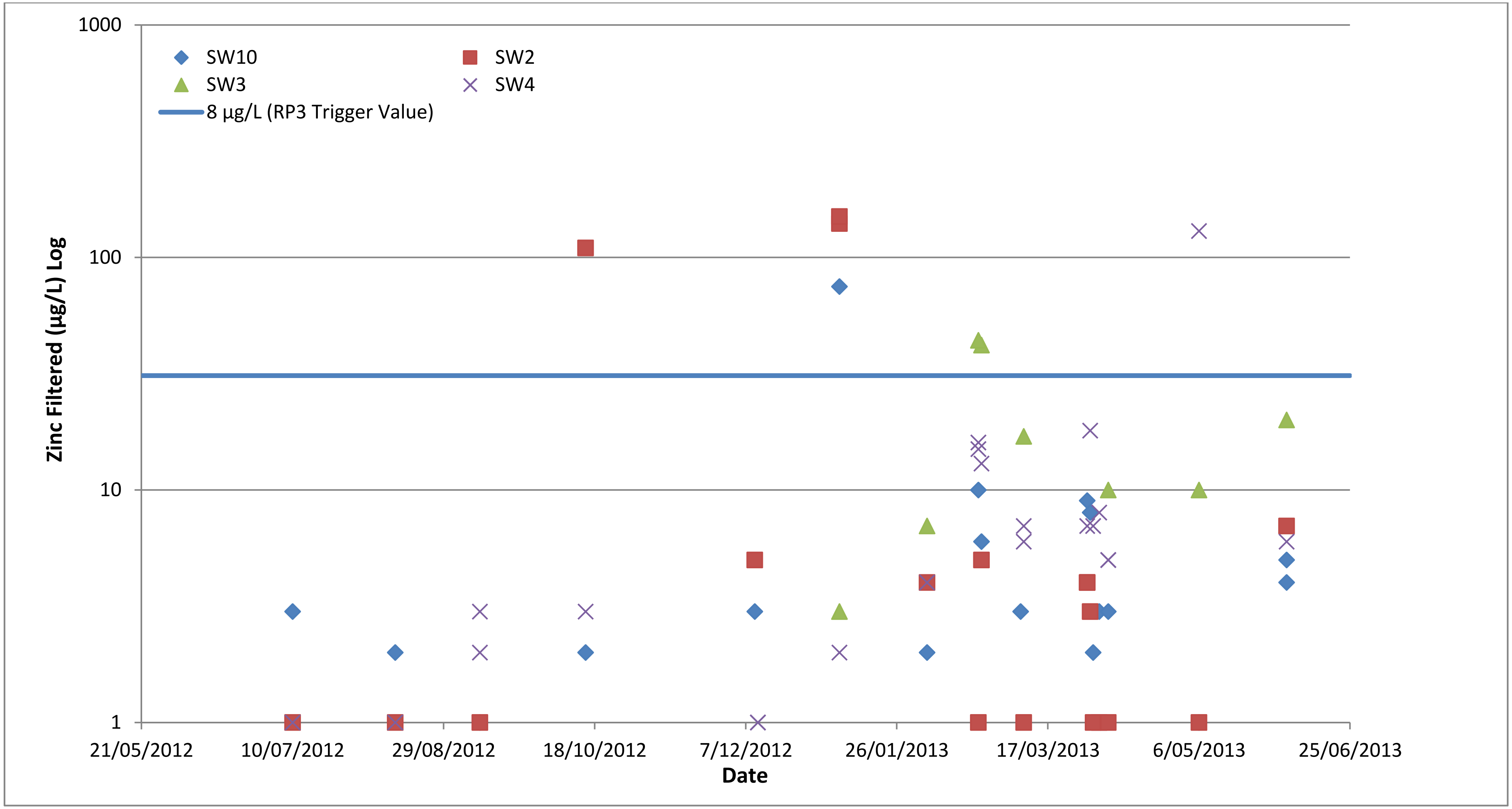

Figure 42 - 0.45µm Filtered Zinc Concentrations at SW2, SW3, SW4 and SW10

6.5.1.2 Retention ponds

Monthly physical water readings and chemistry samples were collected throughout the year at retention ponds RP1, RP2, RP3, RP5, RP7 and HLP.

6.5.1.2.1 Physical quality

Electrical conductivity

As expected EC readings remained reasonably constant in the retention ponds throughout the year (Figure 43). The exception was the HLP pad which reported larger variations likely due to its relative smaller volume and large surface area. All ponds exhibited a general reduction in EC readings over the wet season due to the added surface dilution from rainfall.

pH

All retention ponds exhibit a pH range below 4.5 with the exception of the HLP and RP3 (Figure 44). The annual variation in pH was also consistent again with the exception of the HLP and the treatment process within RP3.

Temperature

Surface pond temperatures were largely consistent and all show the annual seasonal variations.

Dissolved oxygen

DO readings were somewhat inconsistent prior to 2013 and are suspected to be due to instrument problems. Post 2013 all ponds reported DO values above 5 mg/L

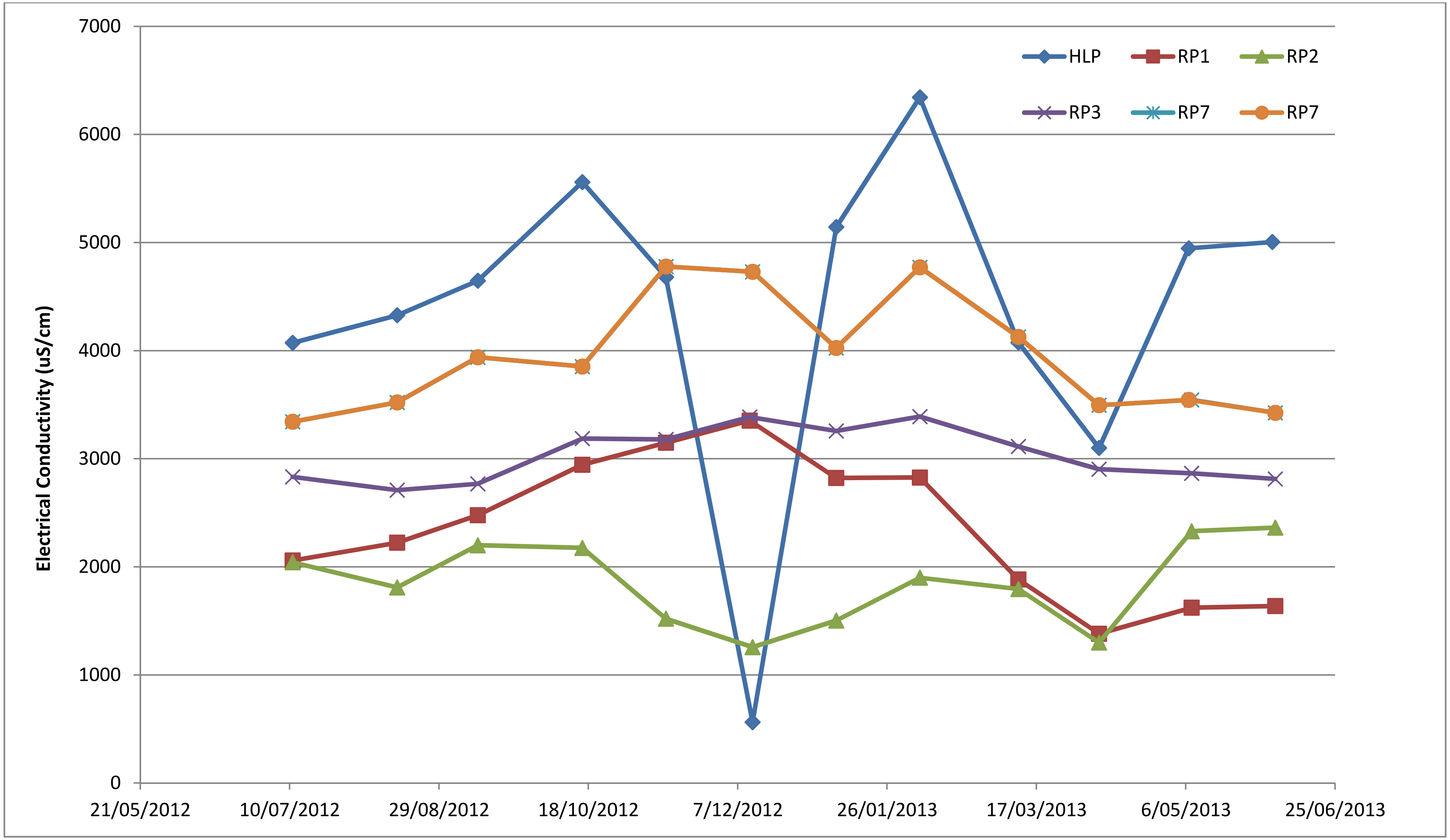

Figure 43 - Electrical conductivity of onsite retention ponds

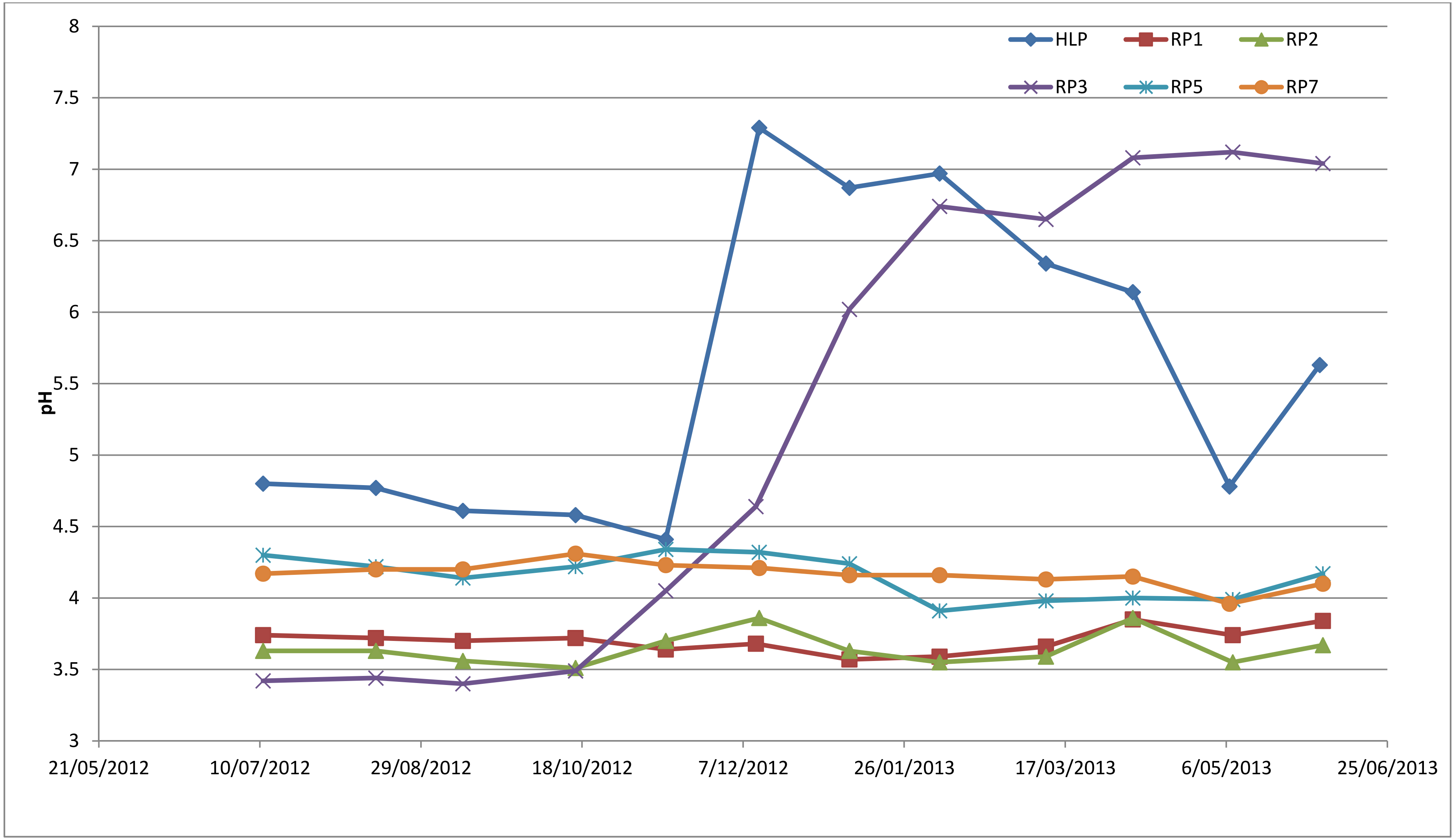

Figure 44 - pH of onsite retention ponds

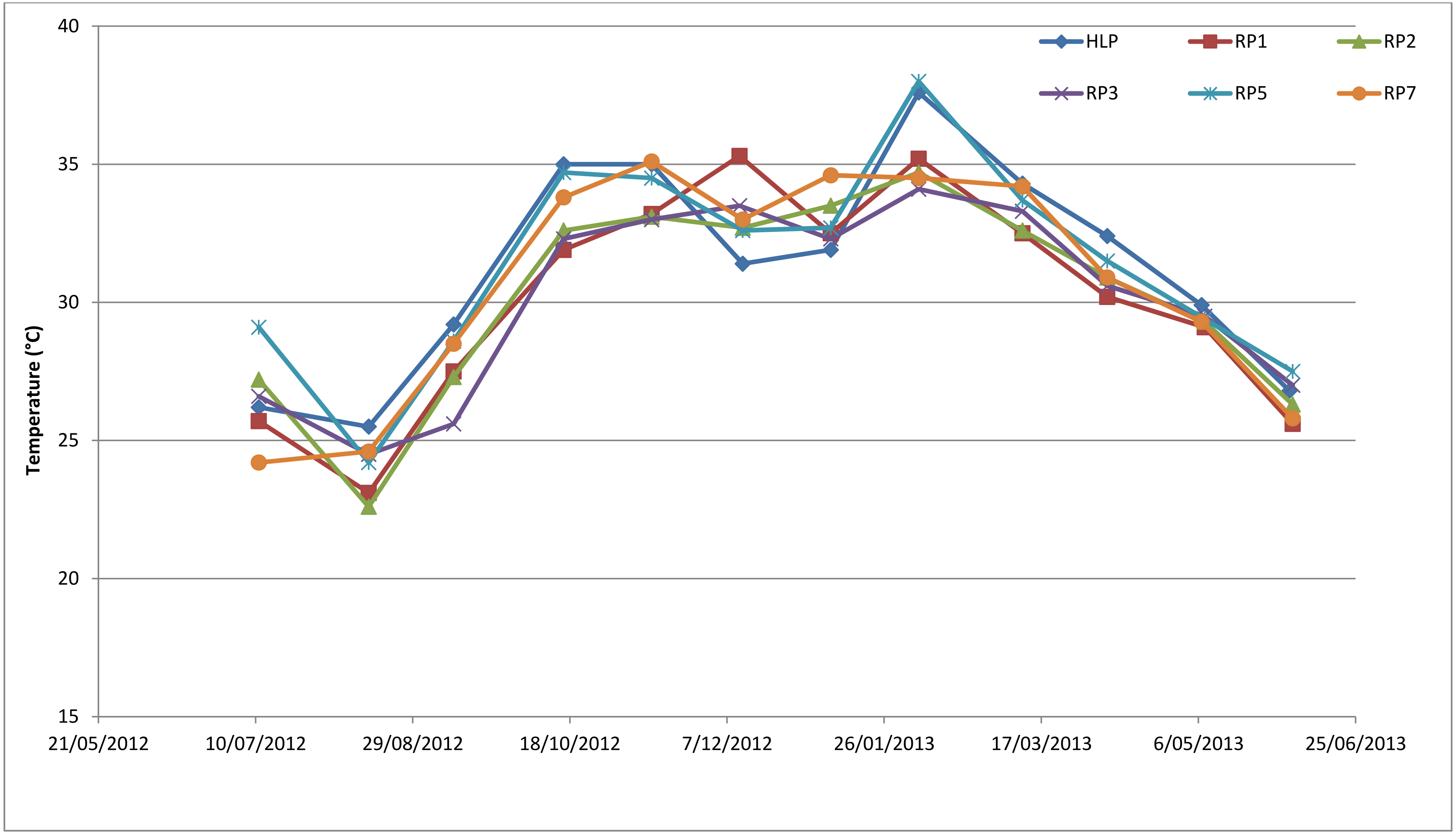

Figure 45 - Temperature of onsite retention ponds

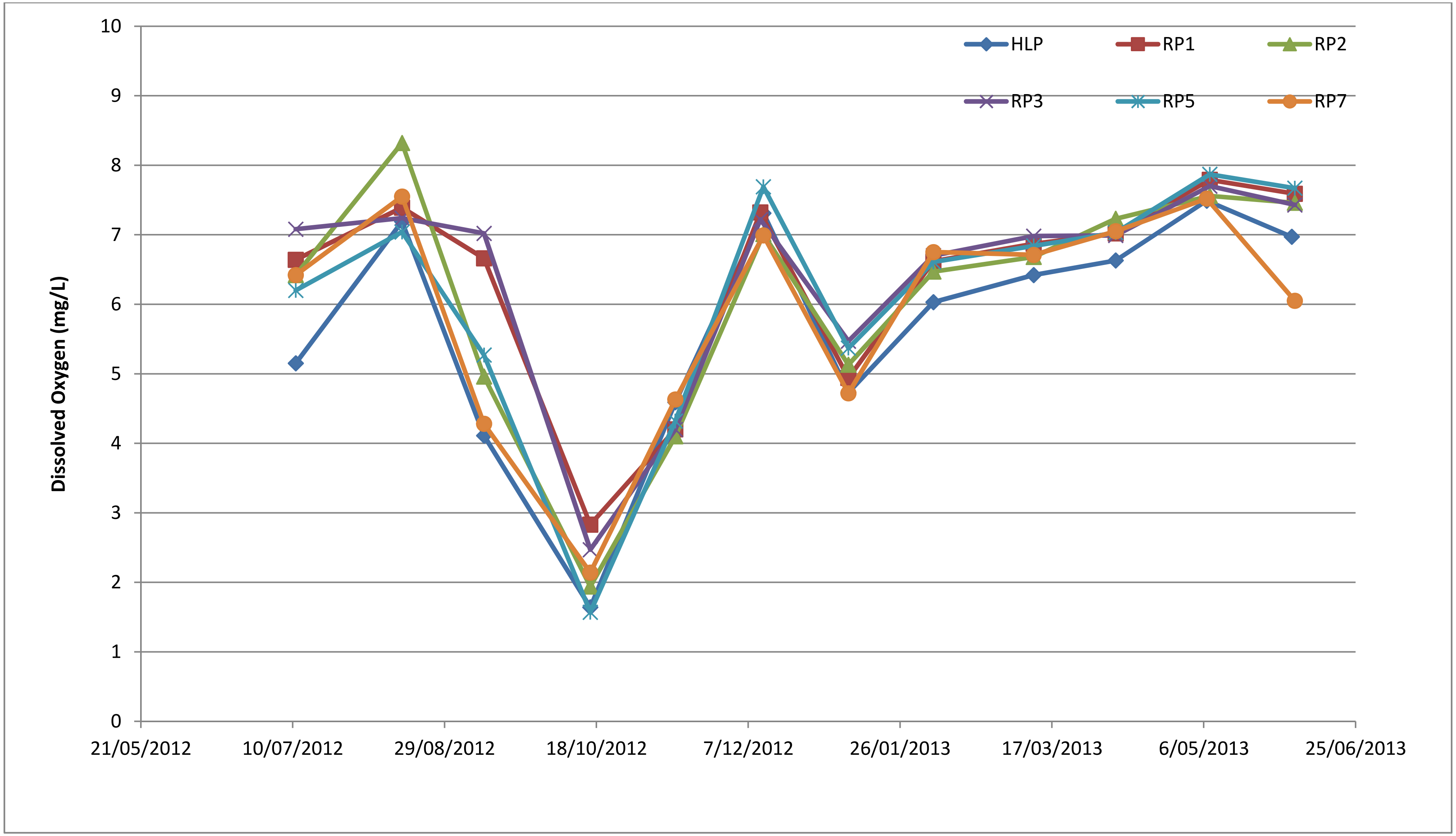

Figure 46 - Dissolved Oxygen of onsite retention ponds

6.5.1.2.2 Chemical quality

Figure 47 though Figure 58 present the filterable metal laboratory results of monthly water samples obtained from the primary retention ponds onsite. The remaining analytes such as total metals and ions are available in Appendix H

All ponds generally exhibited a reduction in metal concentrations over the wet season, due to dilution, which is come cases resulted in halving of concentrations such as copper and manganese in RP1.

Zinc and Aluminium top the list of concentrations up to 35-40 mg/L and 40-70 mg/L respectively. Chromium and Mercury report the lowest filterable results either on or below the LOR across all ponds. An erroneous result is indicated for the mercury data and is expected to be due to record keeping error rather than sample contamination due to the concentrations shown.

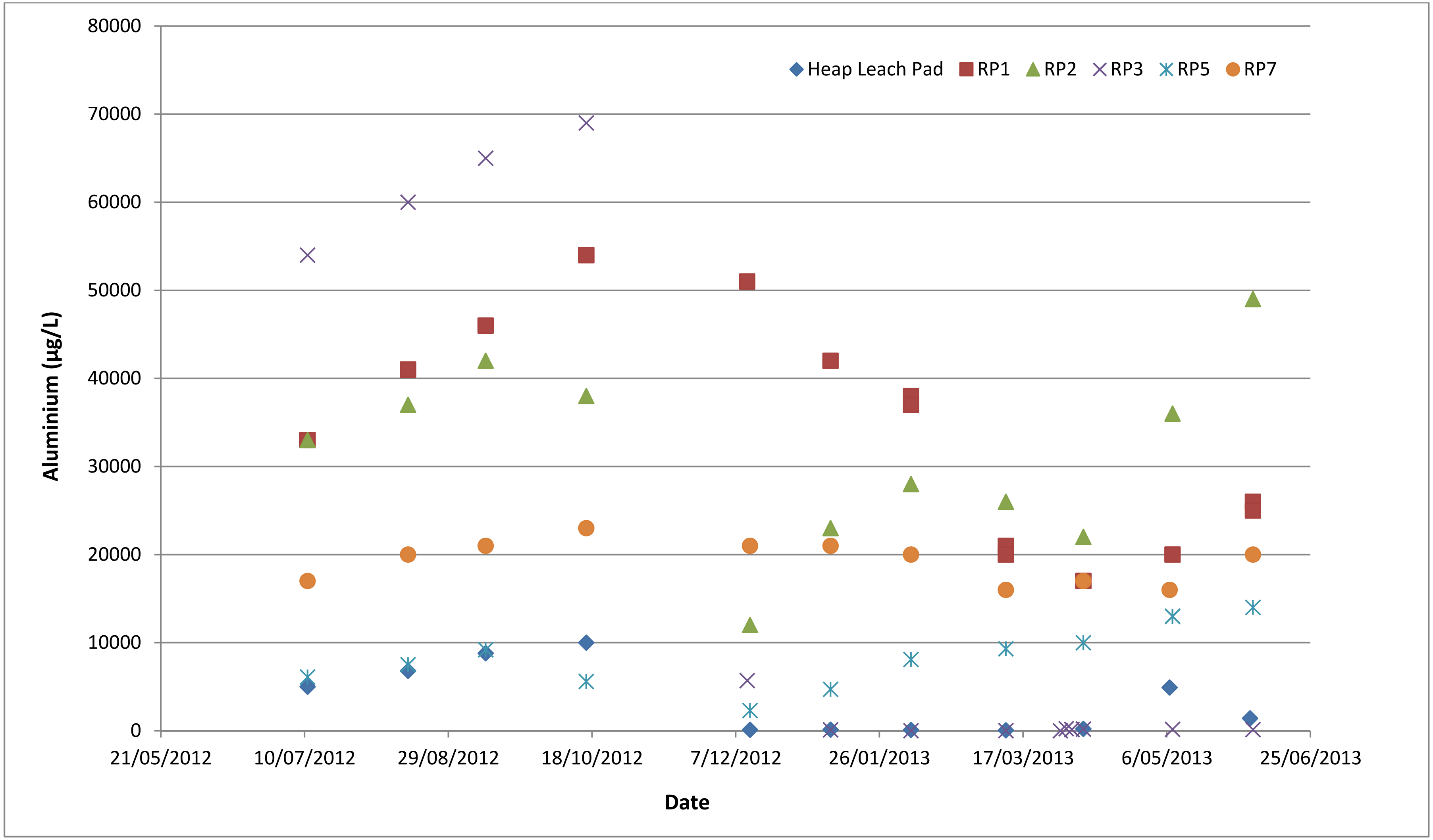

Figure 47 - 0.45 µm filtered Aluminium concentrations in primary retention ponds

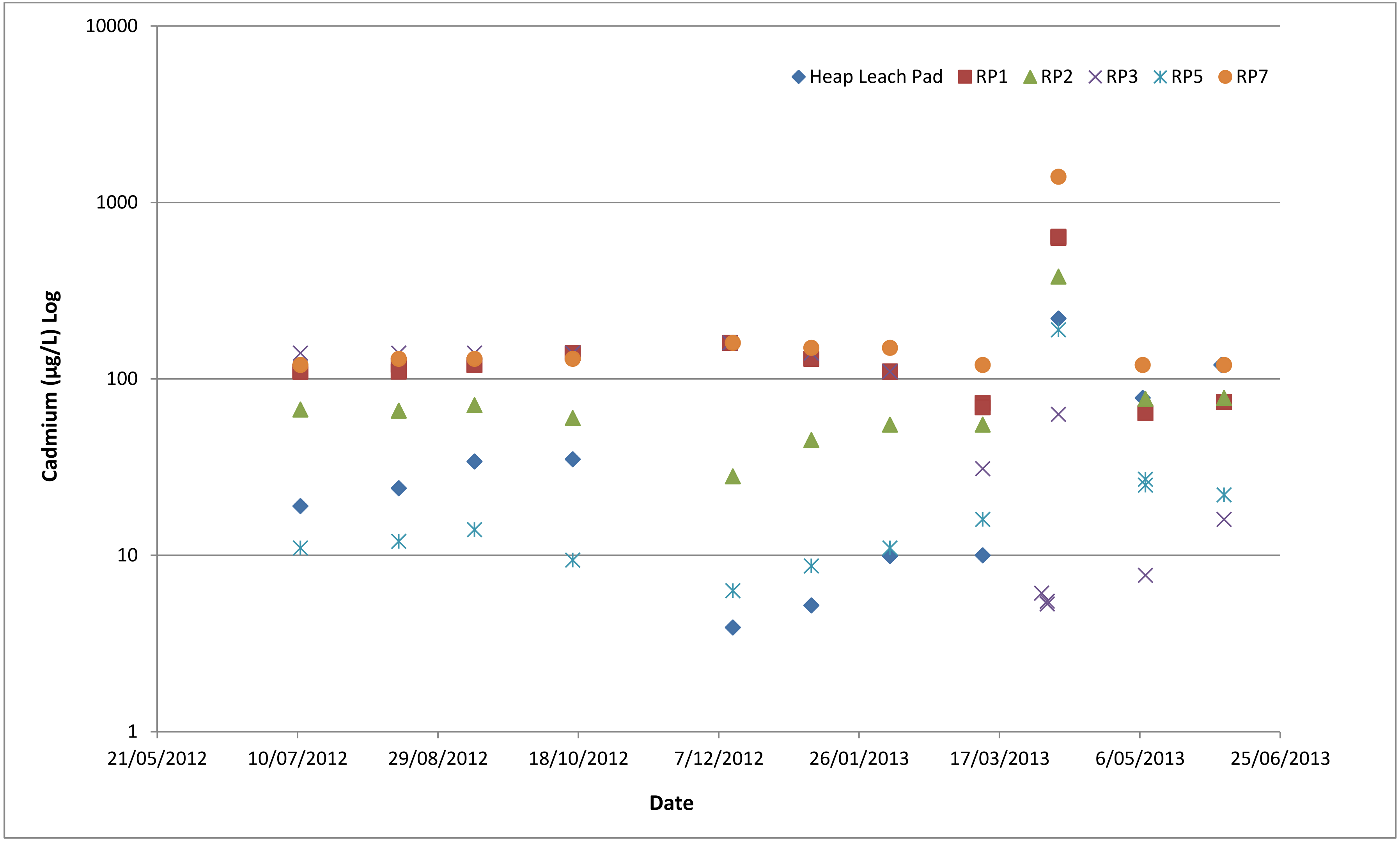

Figure 48 - 0.45 µm filtered Cadmium concentrations in primary retention ponds

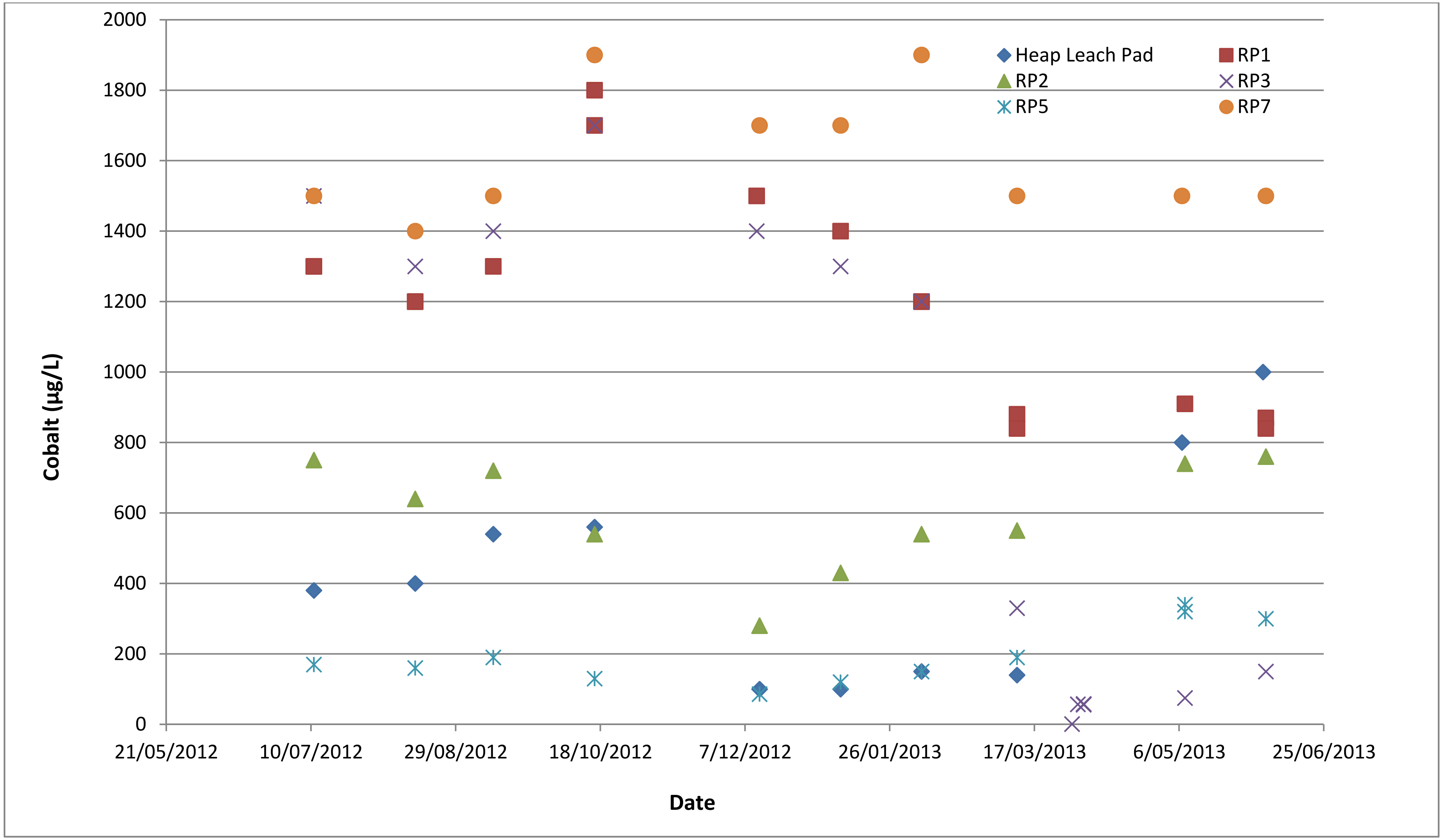

Figure 49 - 0.45 µm filtered Cobalt concentrations in primary retention ponds

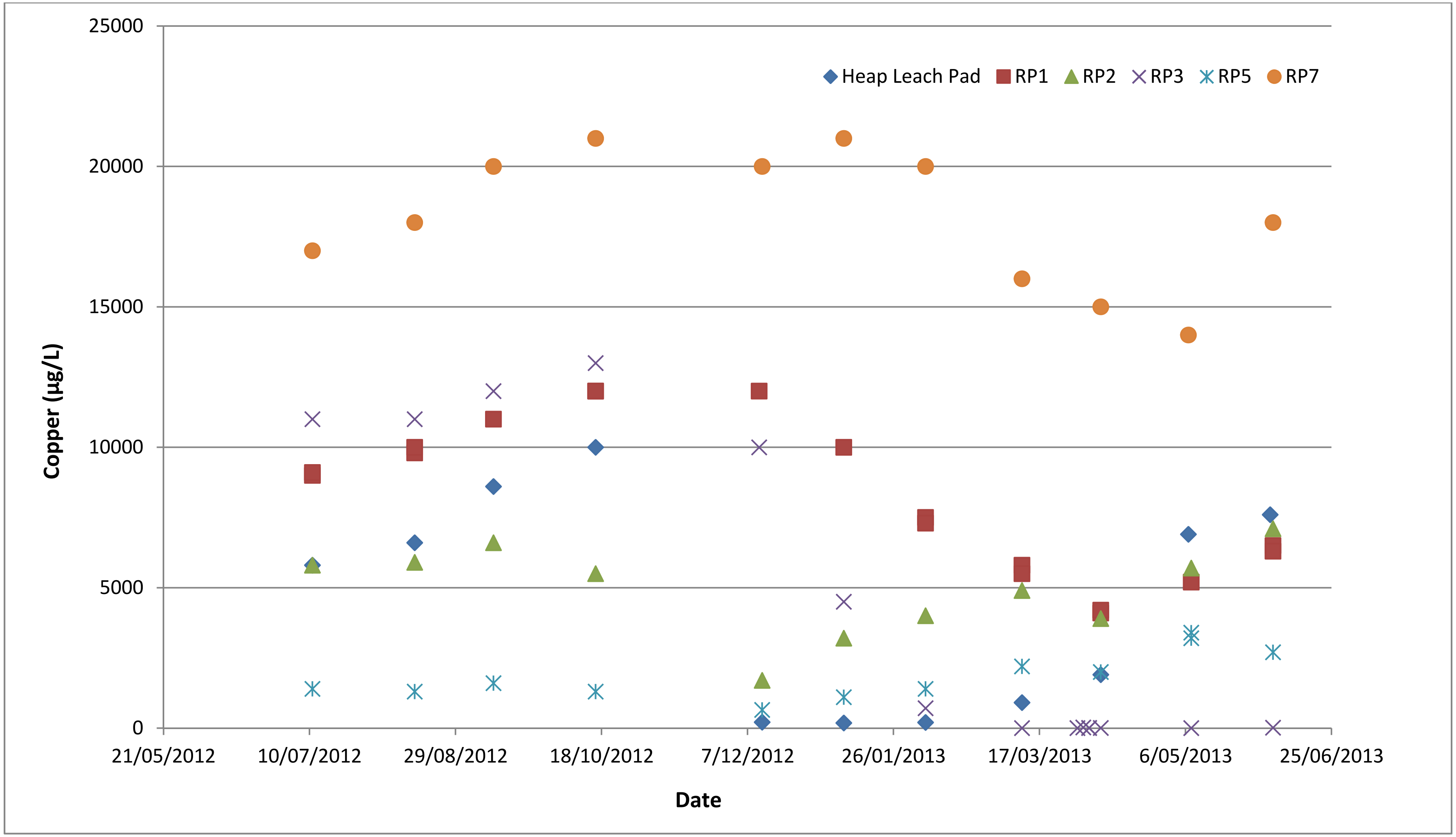

Figure 50 - 0.45 µm filtered Copper concentrations in primary retention ponds

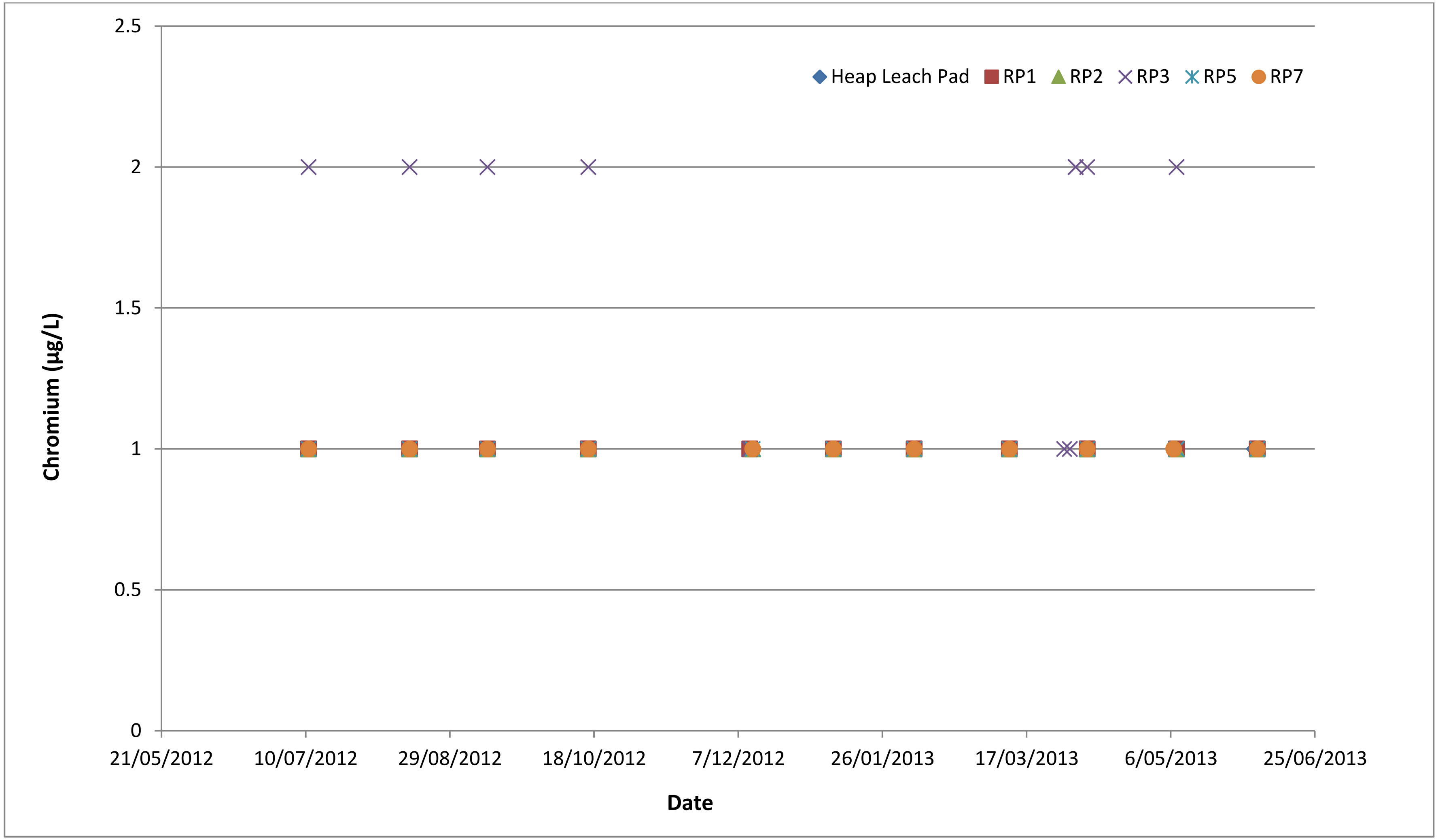

Figure 51 - 0.45 µm filtered Chromium concentrations in primary retention ponds

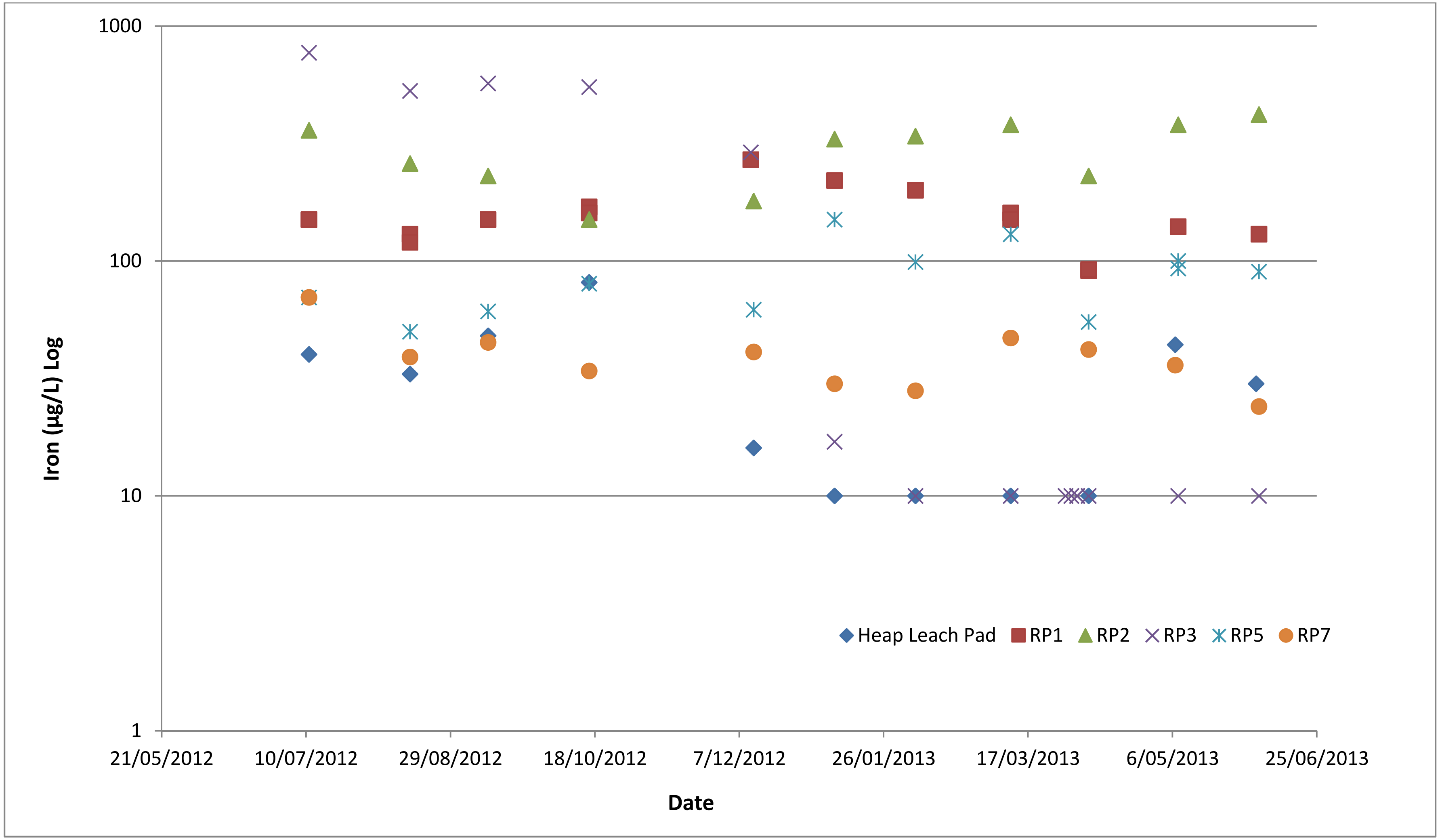

Figure 52 - 0.45 µm filtered Iron concentrations in primary retention ponds

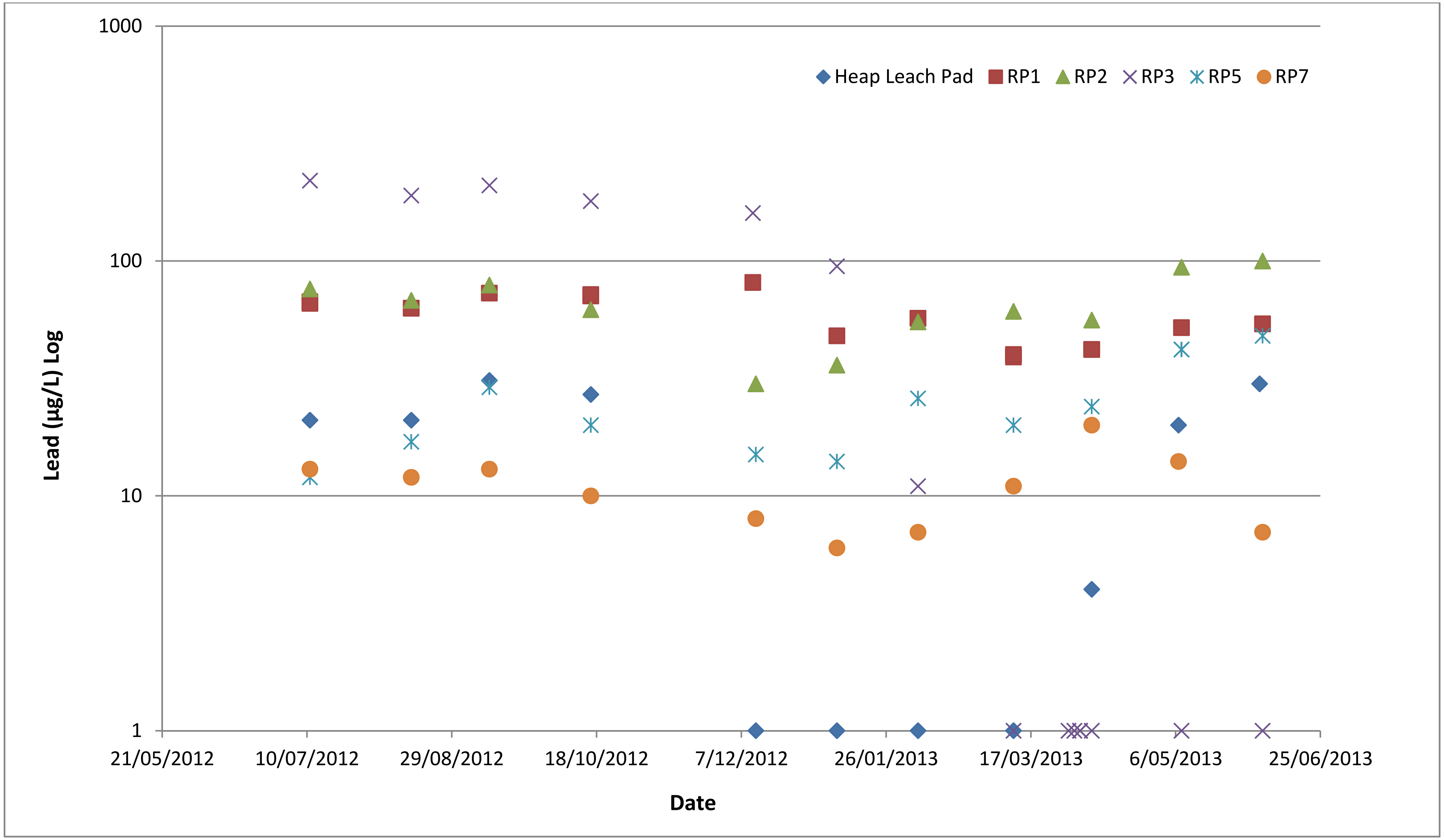

Figure 53 - 0.45 µm filtered lead concentrations in primary retention ponds

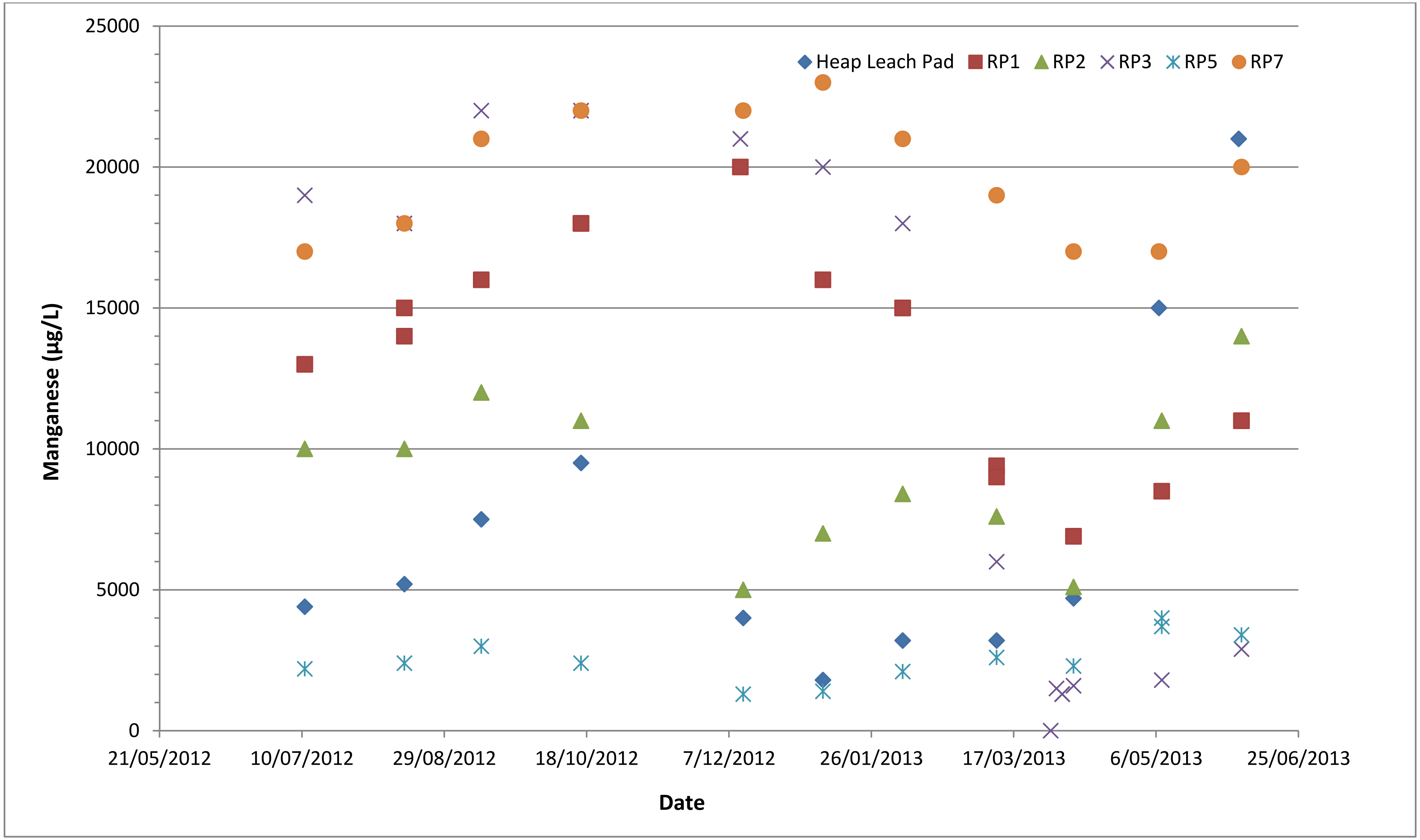

Figure 54 - 0.45 µm filtered Manganese concentrations in primary retention ponds

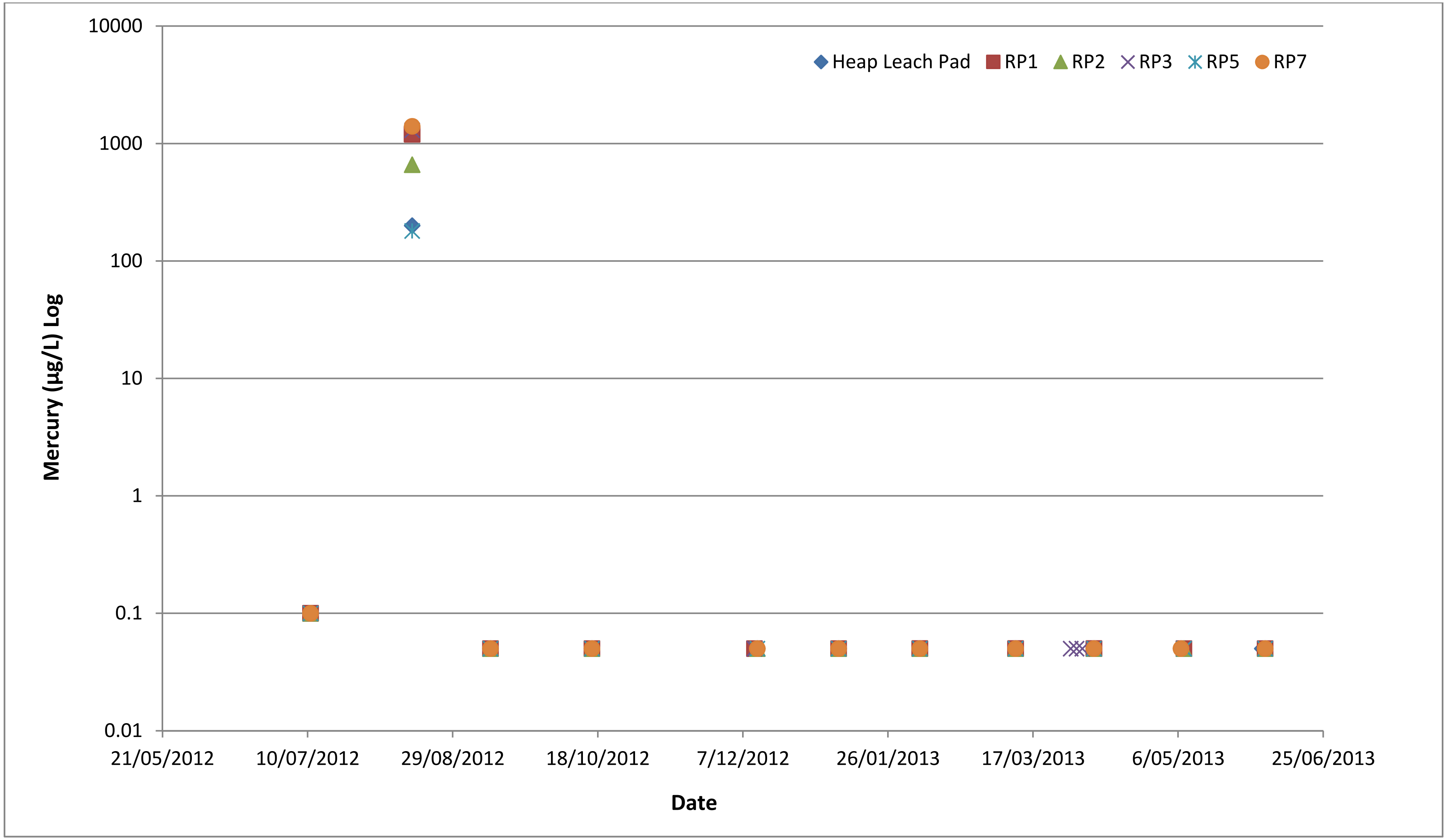

Figure 55 - 0.45 µm filtered Mercury concentrations in primary retention ponds (spike is suspected to be erroneous)

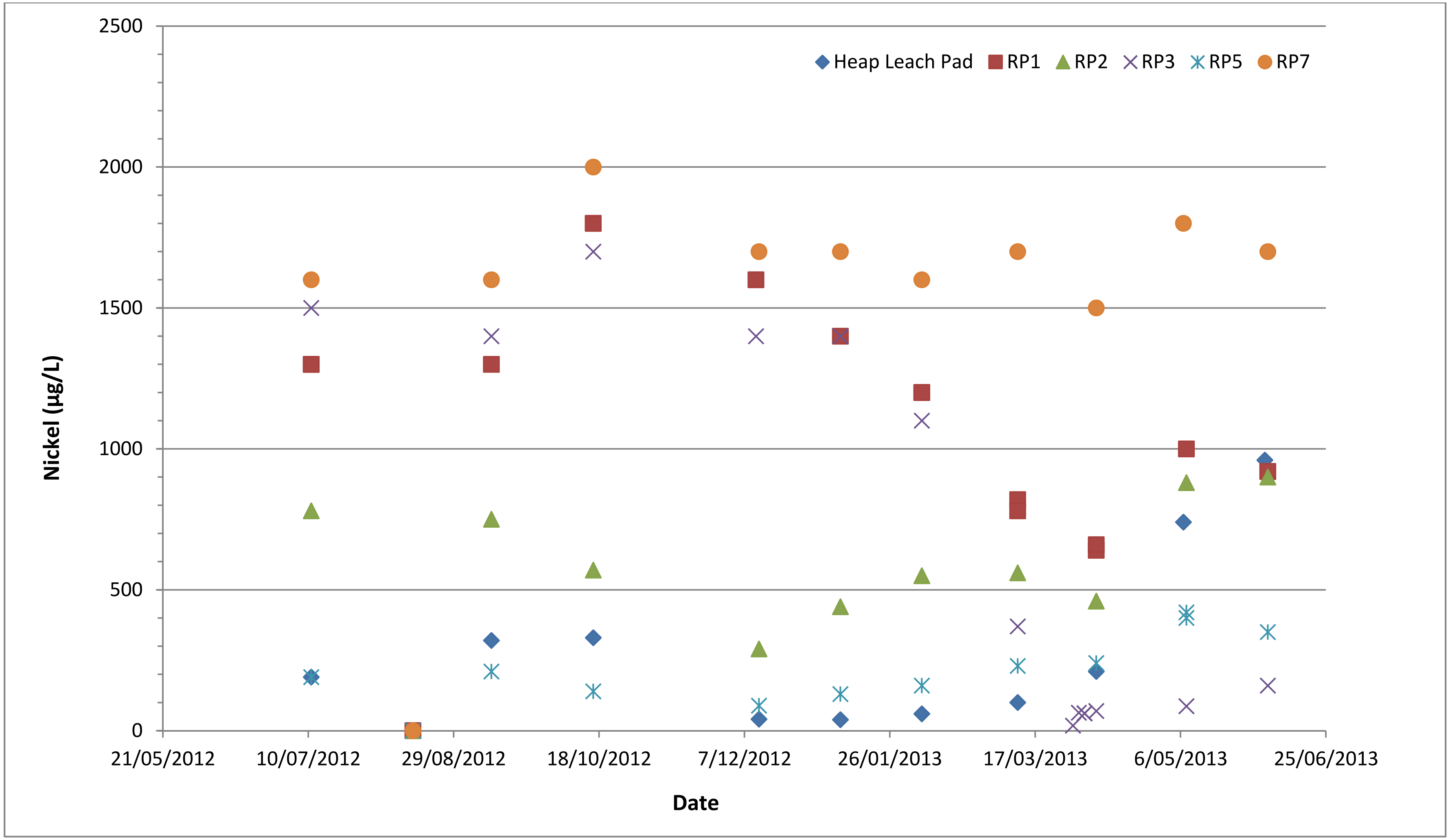

Figure 56 - 0.45 µm filtered Nickel concentrations in primary retention ponds

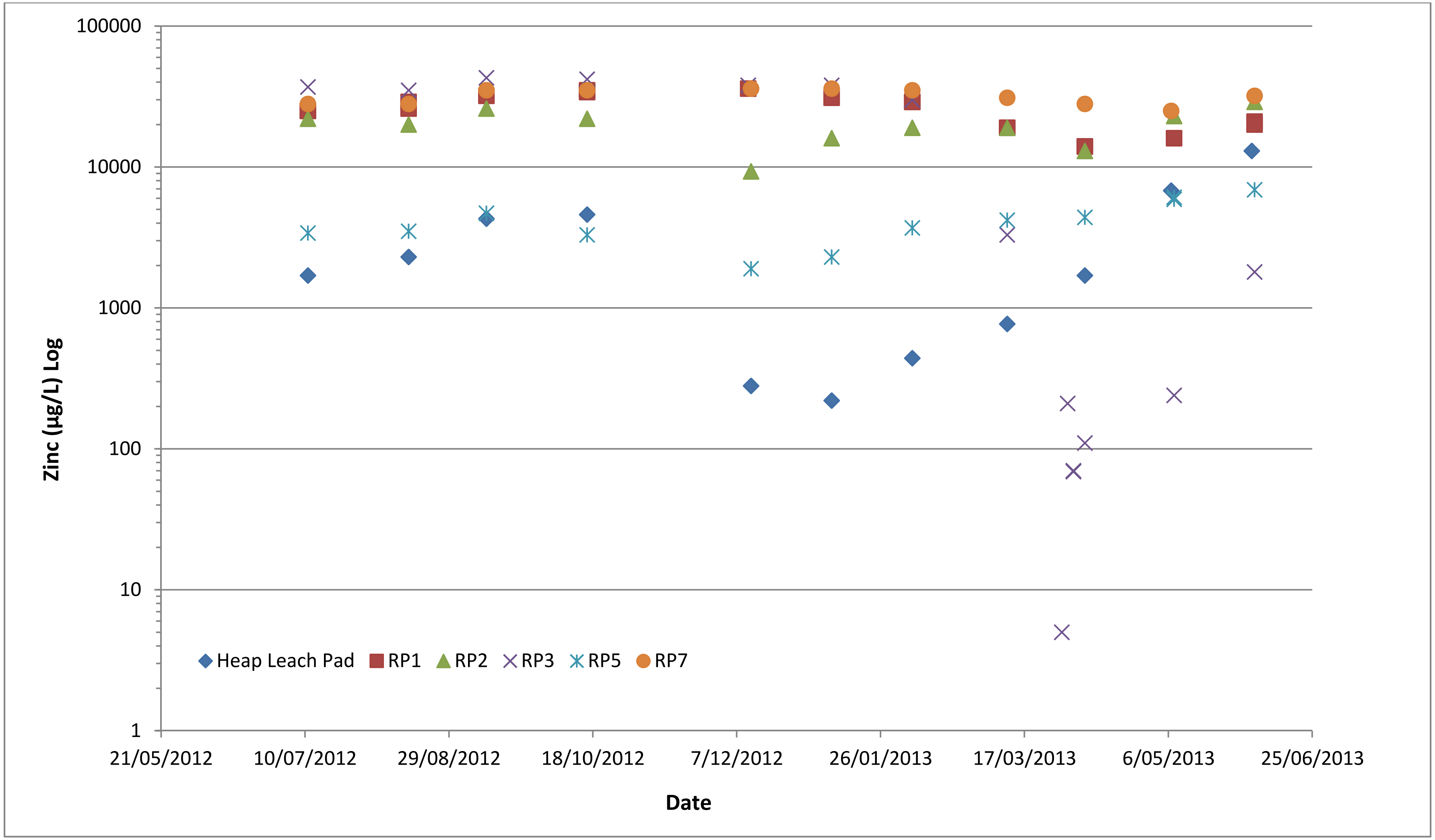

Figure 57 - 0.45 µm filtered Zinc concentrations in primary retention ponds

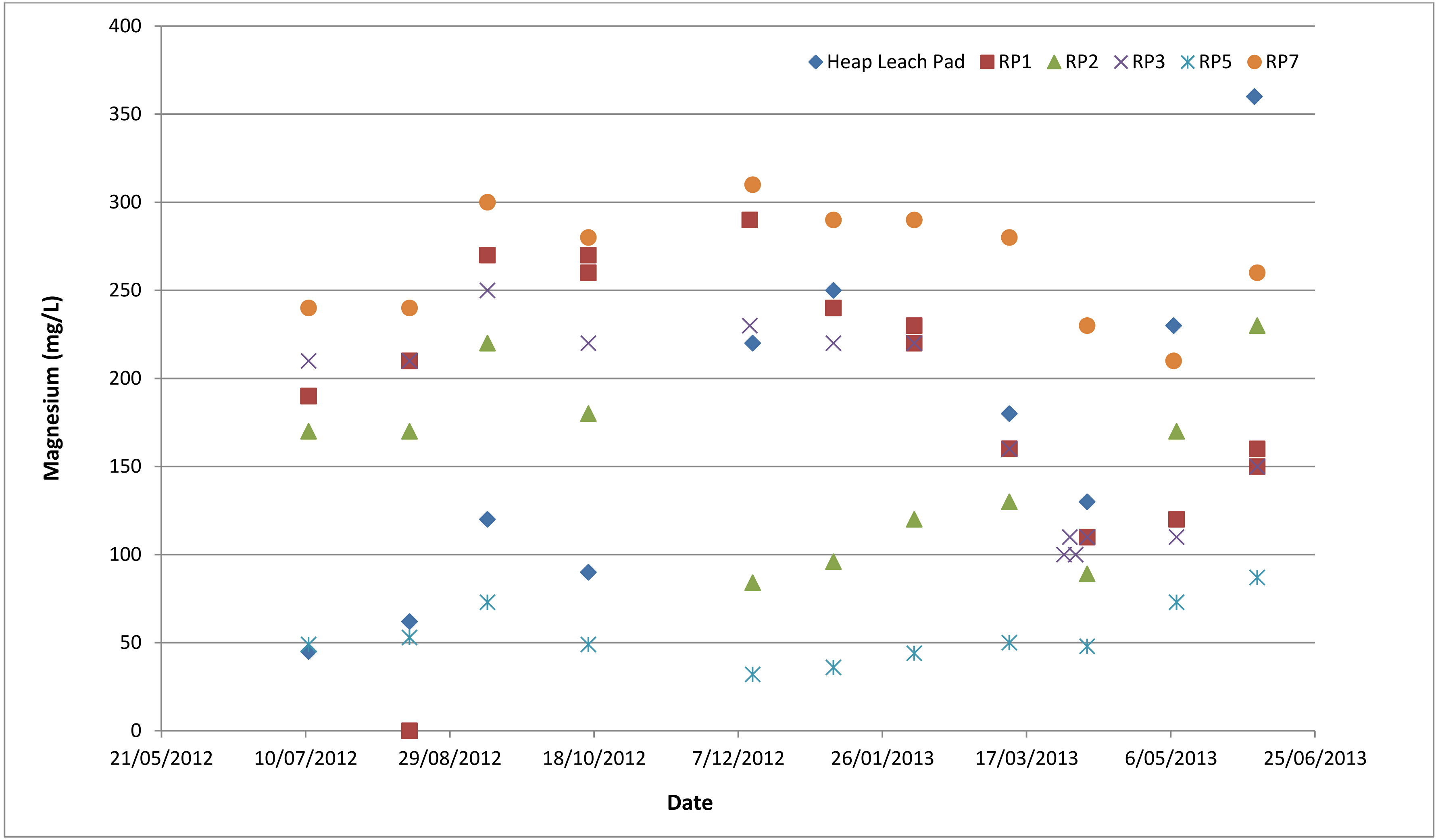

Figure 58 - 0.45 µm filtered Magnesium concentrations in primary retention ponds

6.5.1.3 Other surface waters

A range of other surface waters across the site, other than the primary retention ponds and those associated with WDL requirements are routinely sampled by Vista Gold. These sites include the RWD, SW1, SW5, SW7, SW11, SW12, SW13, SW14 and SW15 whose locations are illustrated in Figure 16. Chemical and physical results of the sites are presented in the following sections. A number of readings are not present in the latter dry season due to many of the ephemeral streams drying out completely.

6.5.1.3.1 Physical quality

Electrical conductivity

EC readings vary from double digit values in good quality waters such as the RWD, SW15, and SW13 through to high reading of 3000+ in known AMD affected sites such as SW7 and SW11. All sites generally show a reduction in EC during rainfall as the volume of dilution increases.

pH

pH values typically range from 5.5 through 8 across the surface water sites. All sites exhibited a slight reduction in pH values over the wet season

Temperature

Temperatures across the year ranged from low twenties through to mid-thirties and are consistent with temperature ranges witnessed in ponds and discharge sampling sites.

Dissolved oxygen

DO varied substantially with some lower readings likely to be due to the instrument error.

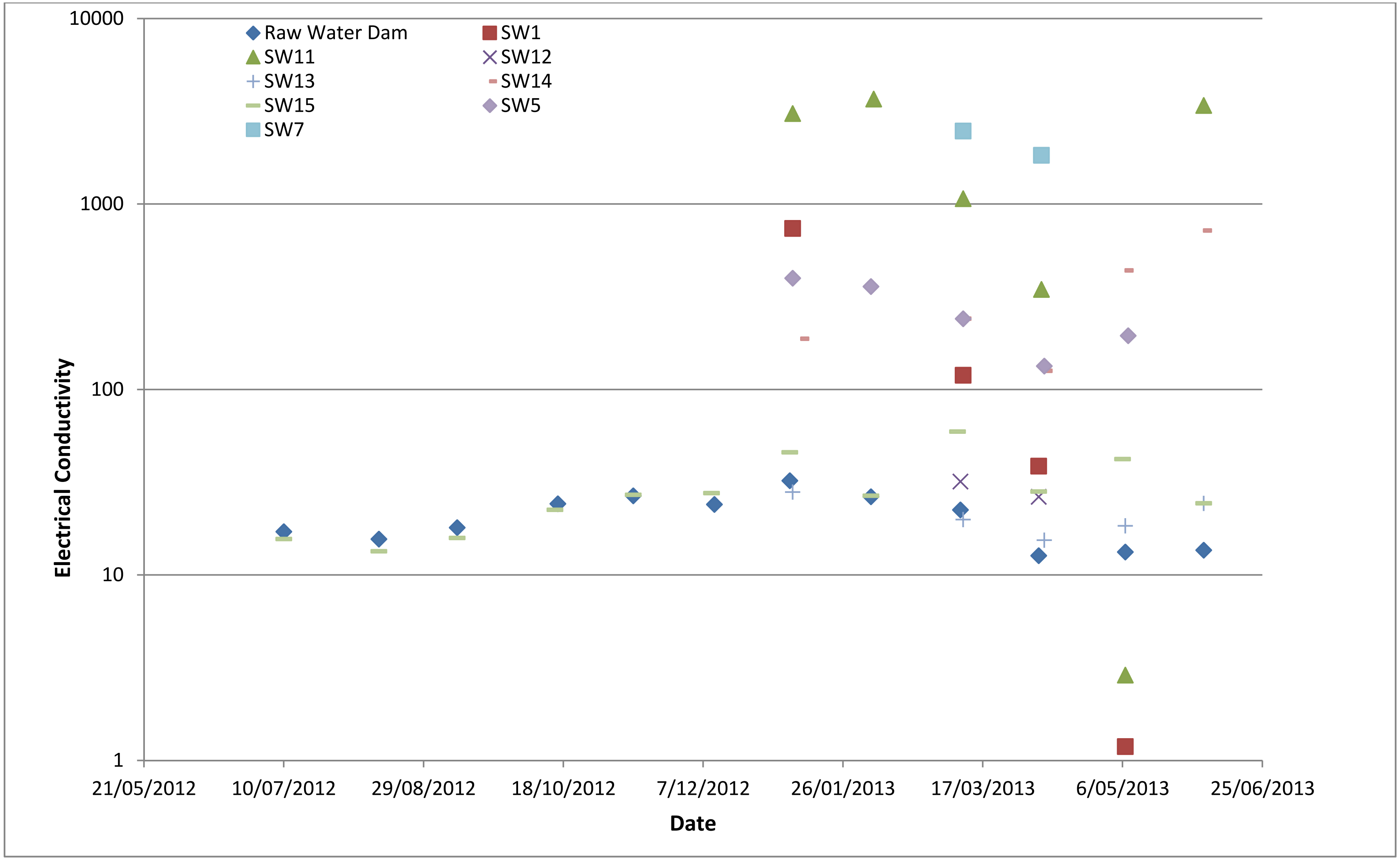

Figure 59 - Electrical Conductivity readings at non RP or discharge related sites

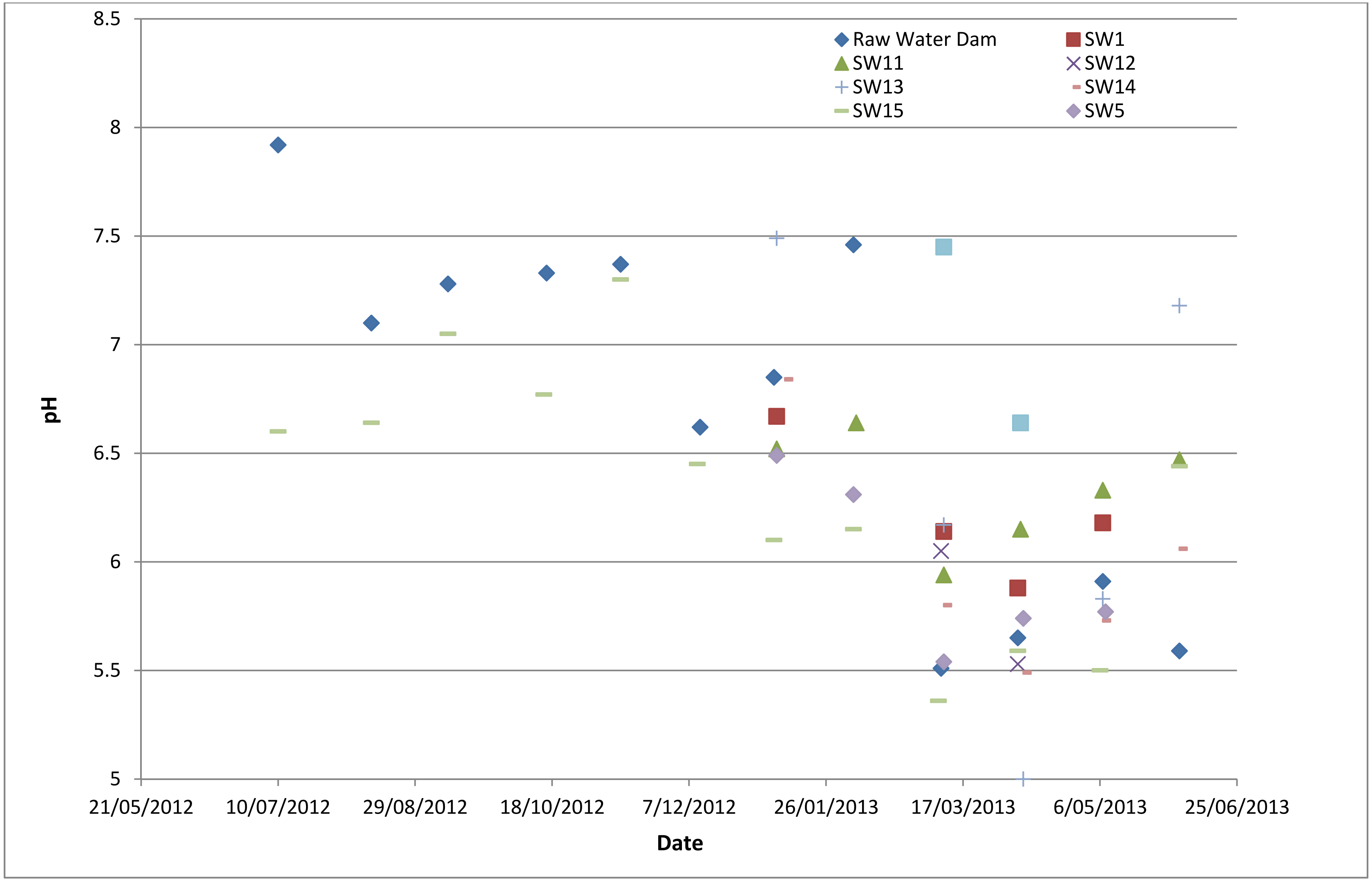

Figure 60 - pH readings at non RP or discharge related sites

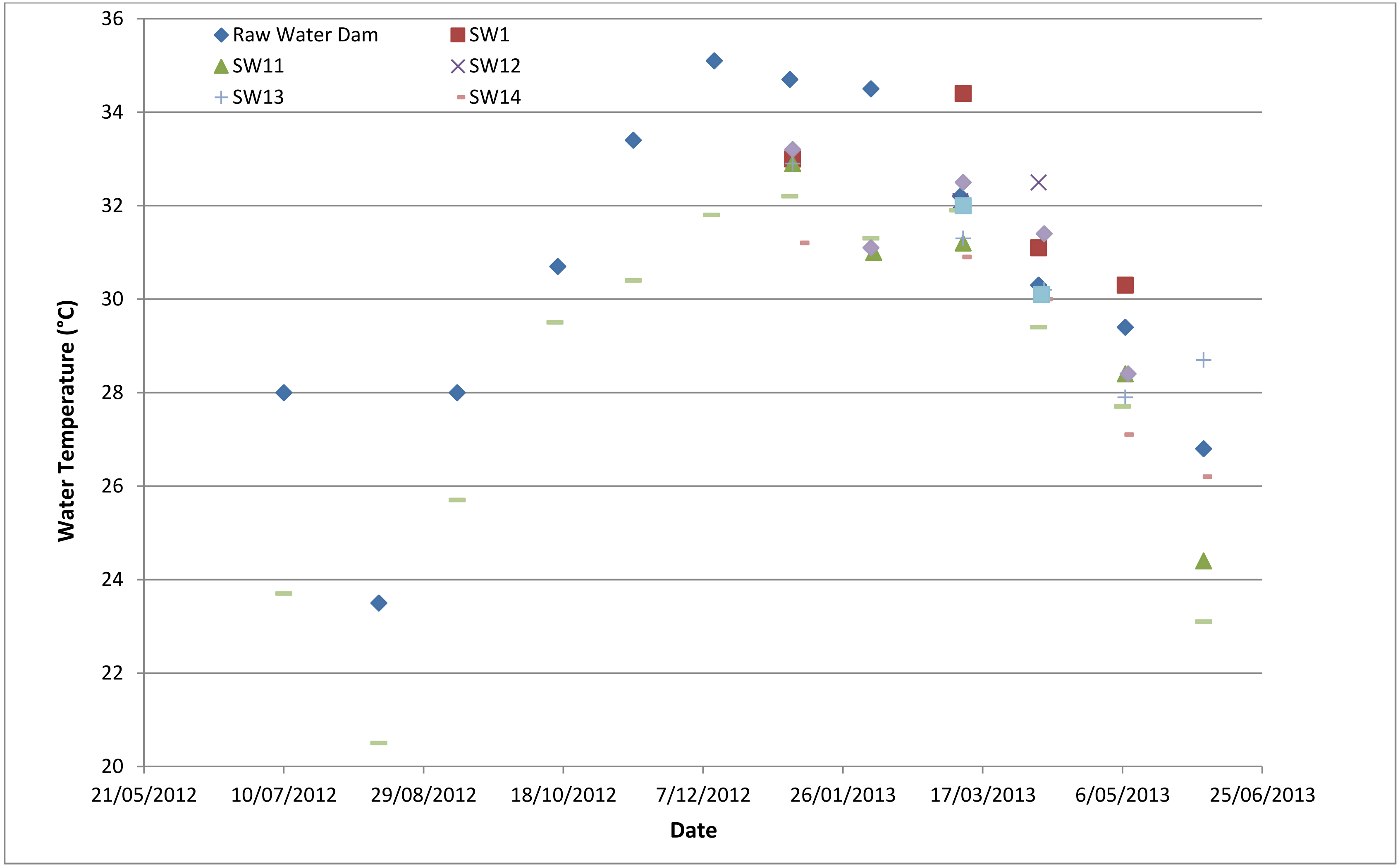

Figure 61 - Temperature readings at non RP or discharge related sites

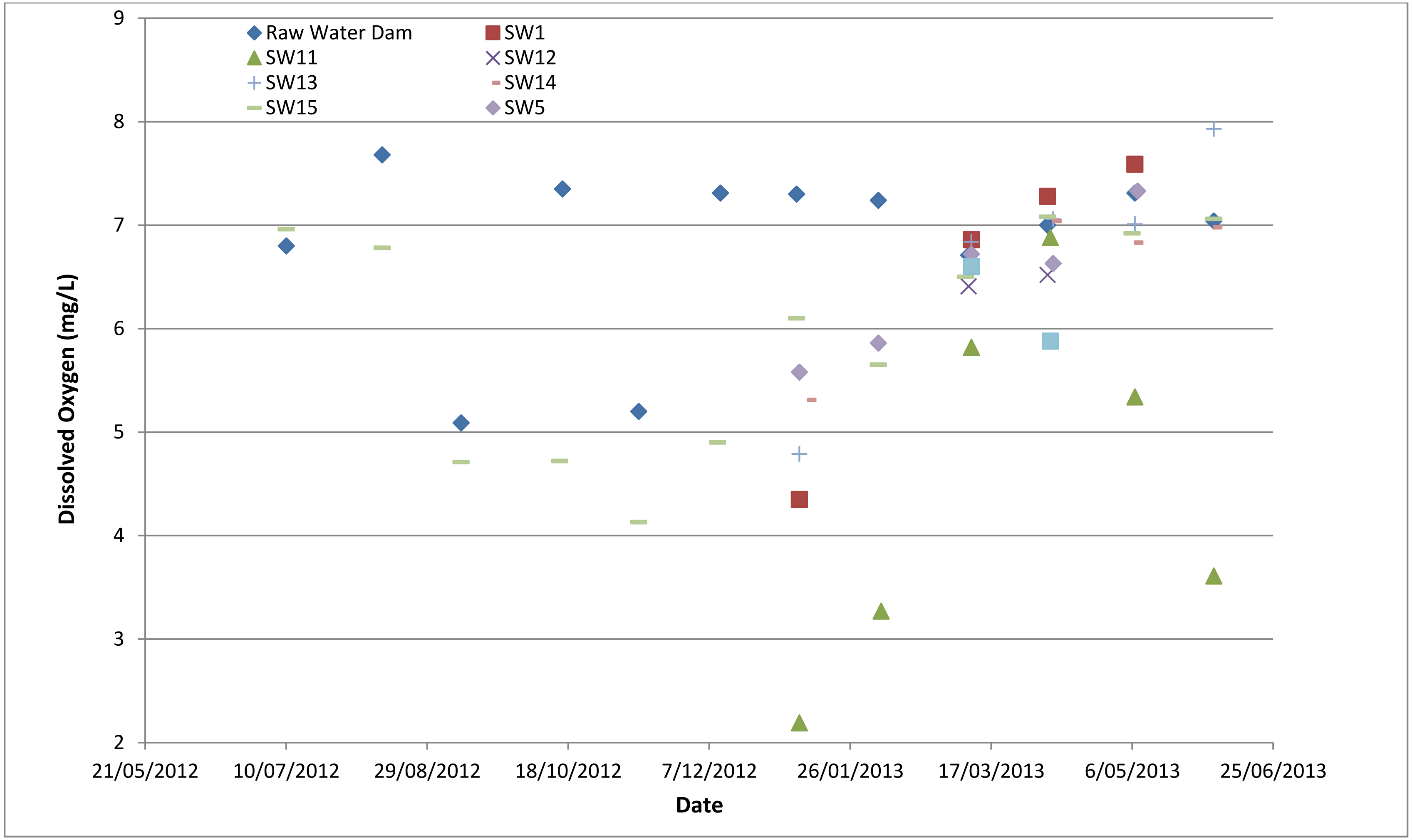

Figure 62 - Dissolved Oxygen at non RP or discharge related sites

6.5.1.3.2 Chemical quality

Figure 63 through Figure 74 present the monthly 0.45µm filterable results for the non-pond or discharge related sites. A number of the sites do not report any values for the dry season due to these ephemeral streams being dry. Horseshoe and Batman Creek as monitored by SW1, SW11 and SW5 consistently report higher concentrations in various filterable results. The higher values displayed by SW1 and SW11 are expected due to the seepages from RP7, but the origins of contaminants within Batman Creek (SW5) are not yet fully understood. The RWD consistently reports low or undetectable concentrations across all the filterable metals.

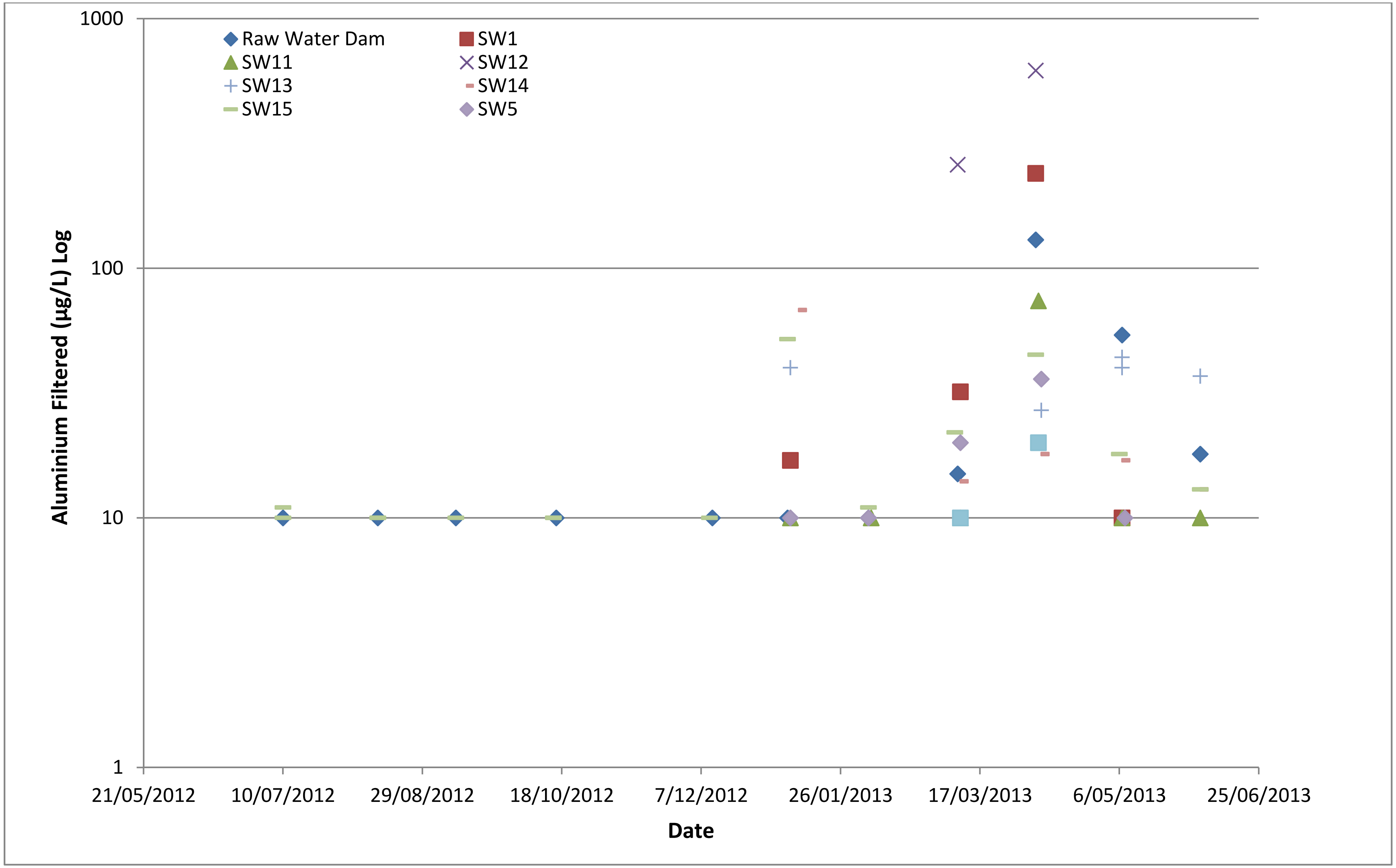

Figure 63 – 0.45 µm Filtered Aluminium readings at non RP or discharge related sites

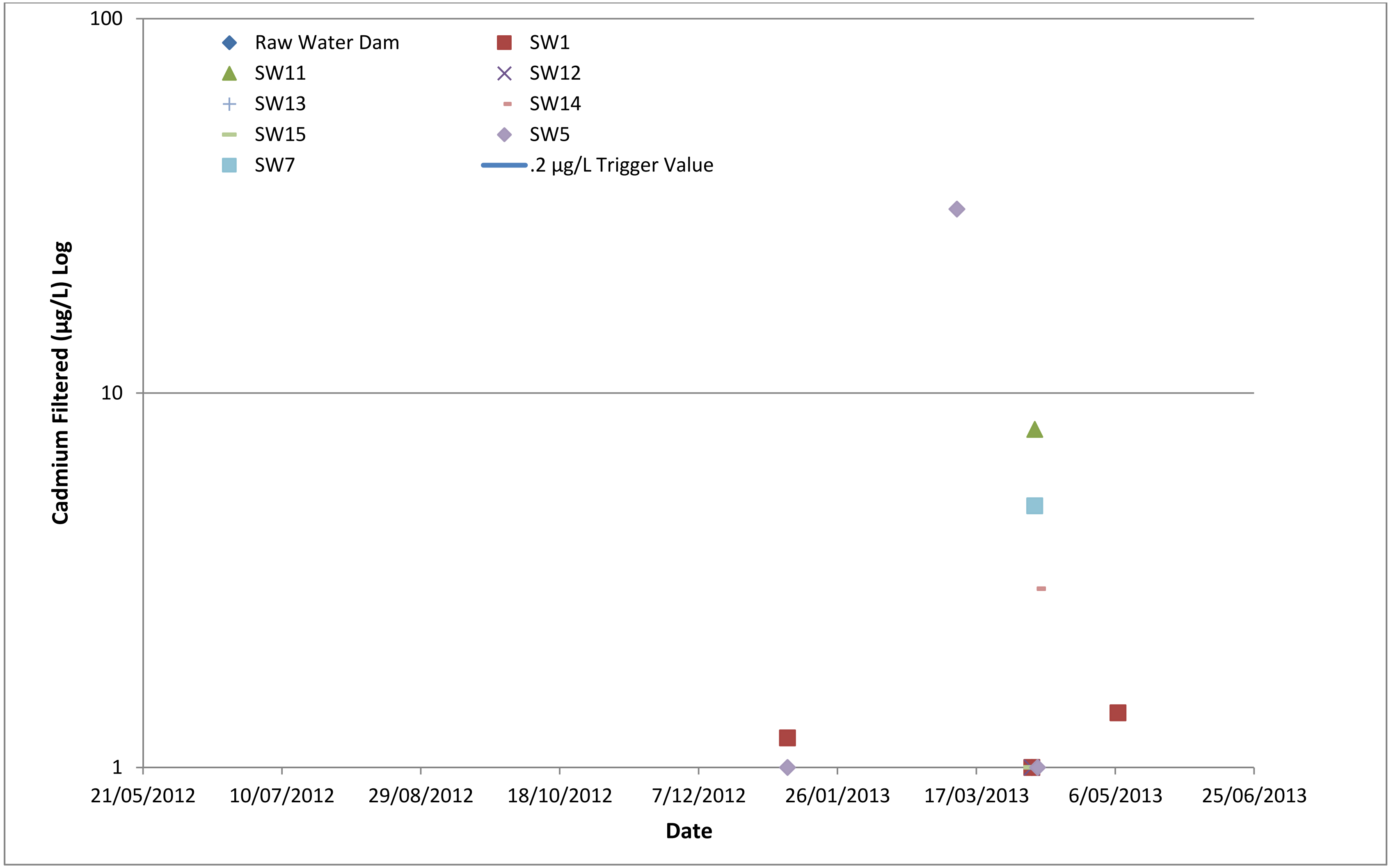

Figure 64 – 0.45 µm Filtered Cadmium readings at non RP or discharge related sites

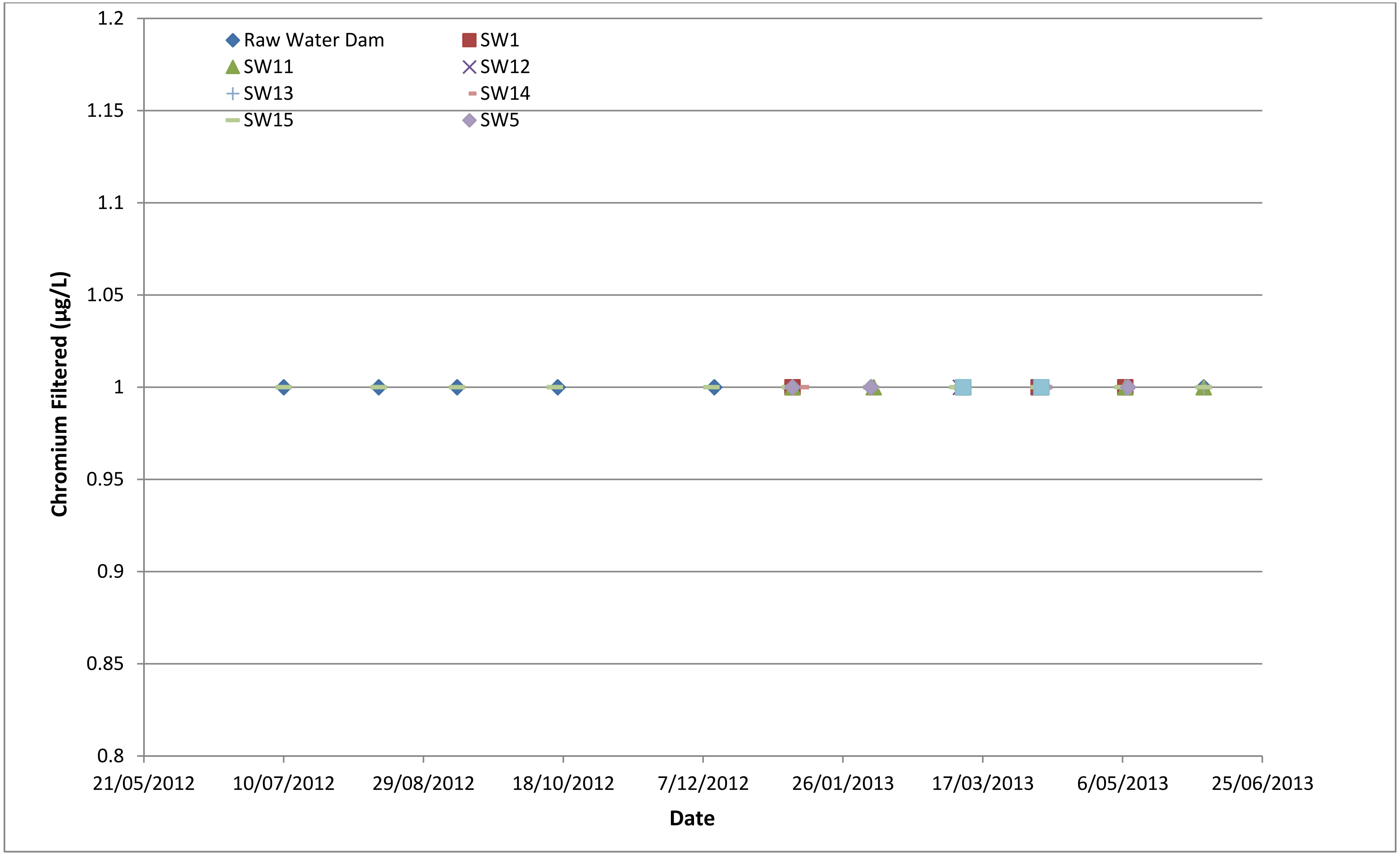

Figure 65 – 0.45 µm Filtered Chromium readings at non RP or discharge related sites

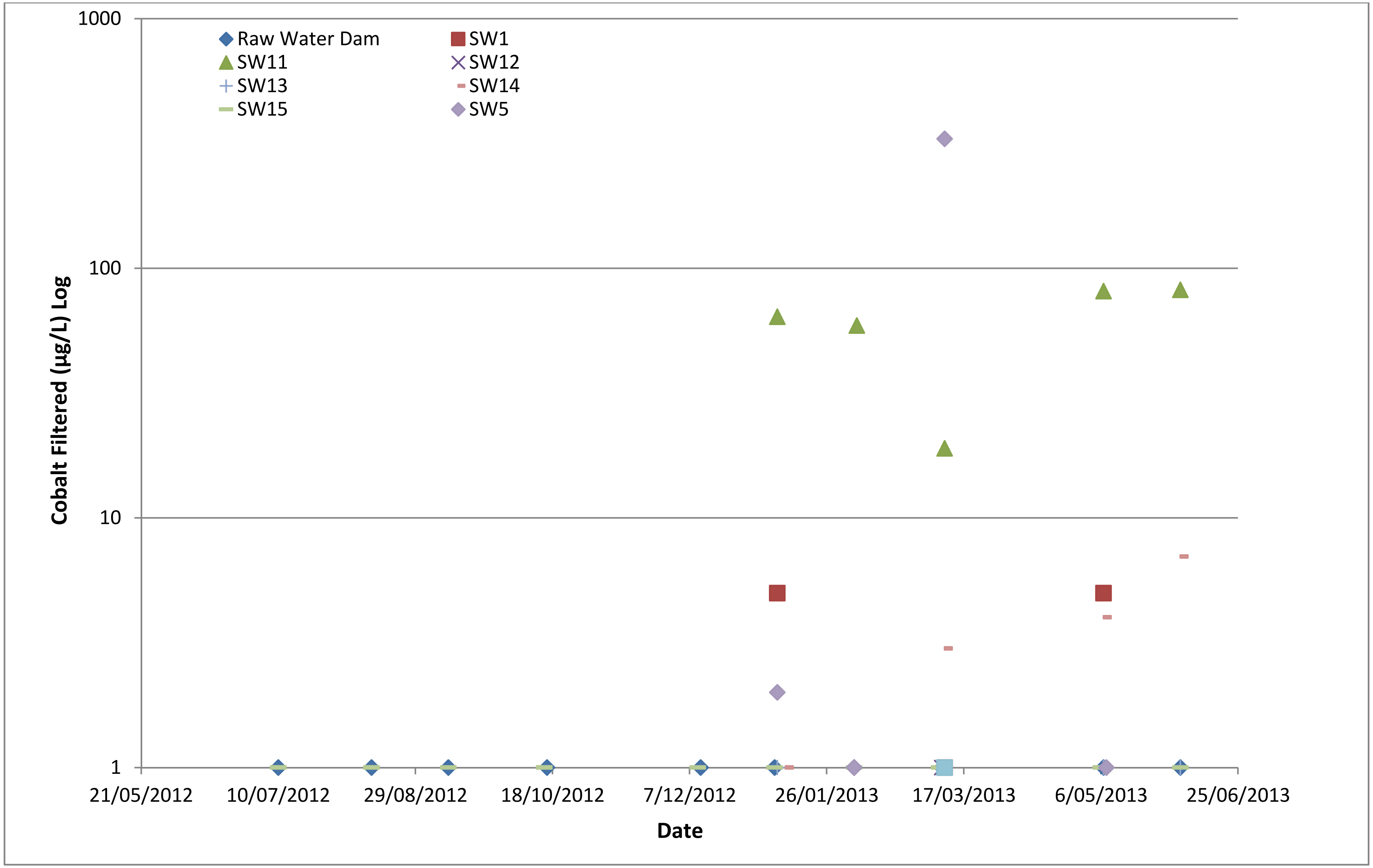

Figure 66 – 0.45 µm Filtered Cobalt readings at non RP or discharge related sites

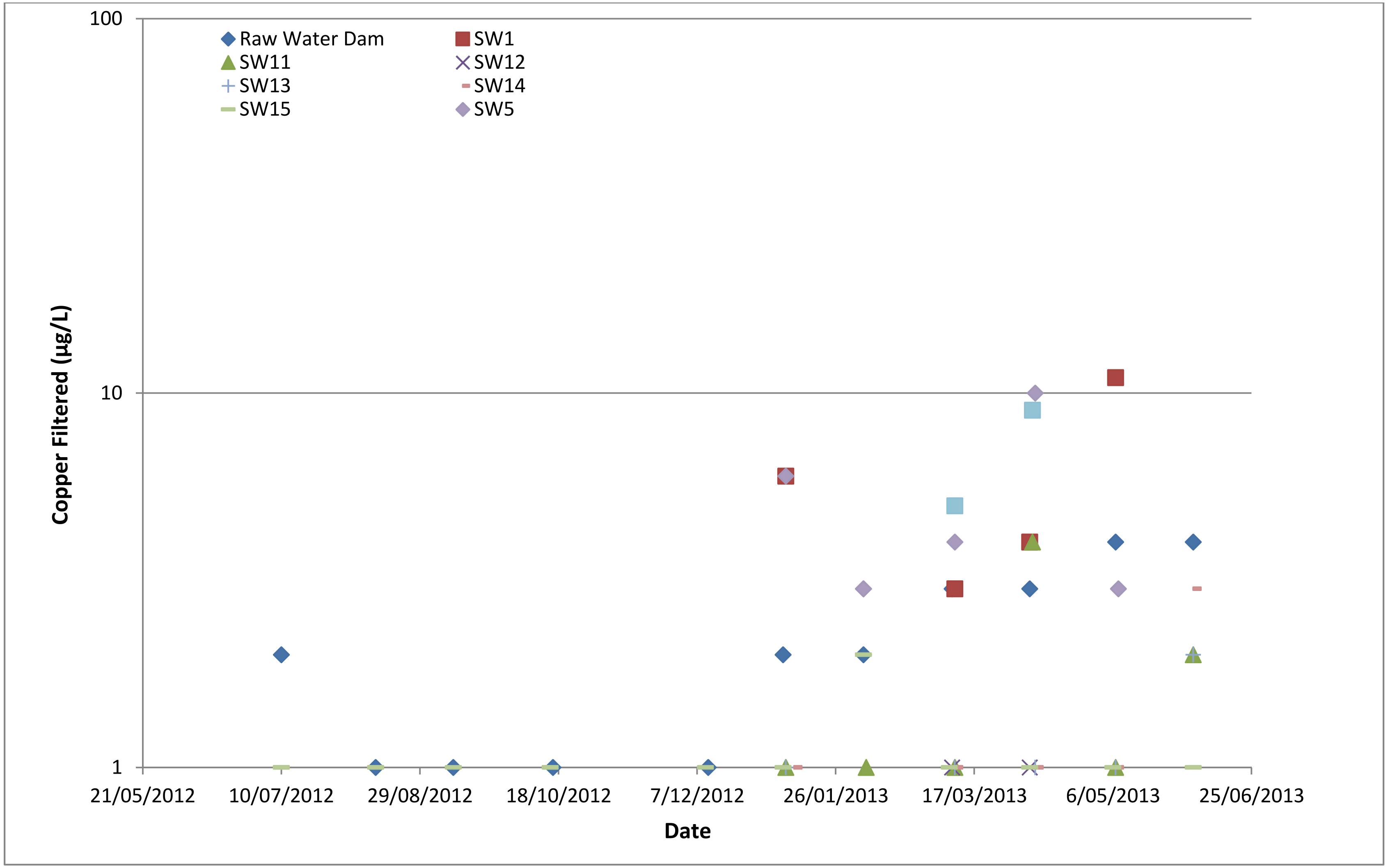

Figure 67 – 0.45 µm Filtered Copper readings at non RP or discharge related sites

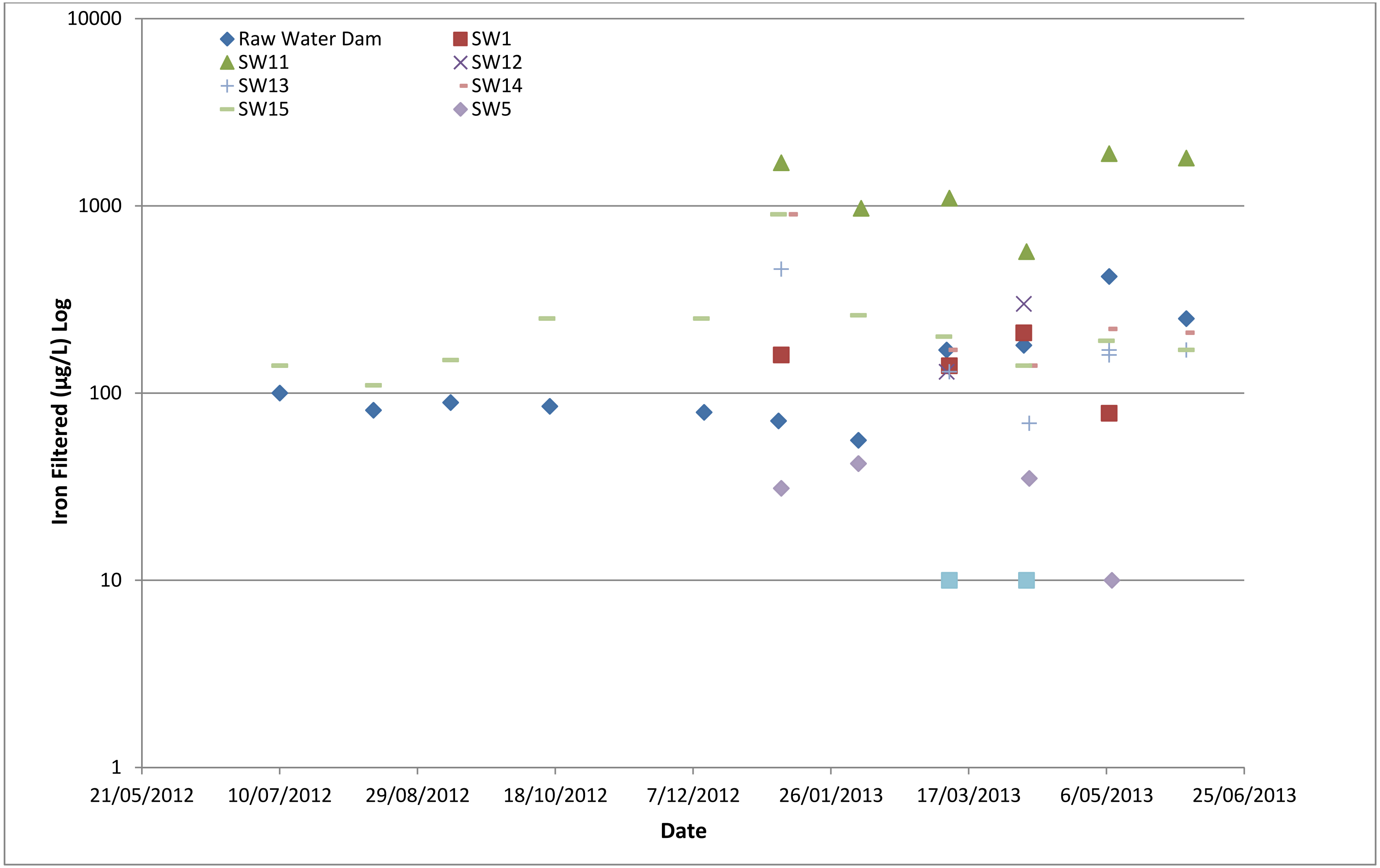

Figure 68 – 0.45 µm Filtered Iron readings at non RP or discharge related sites

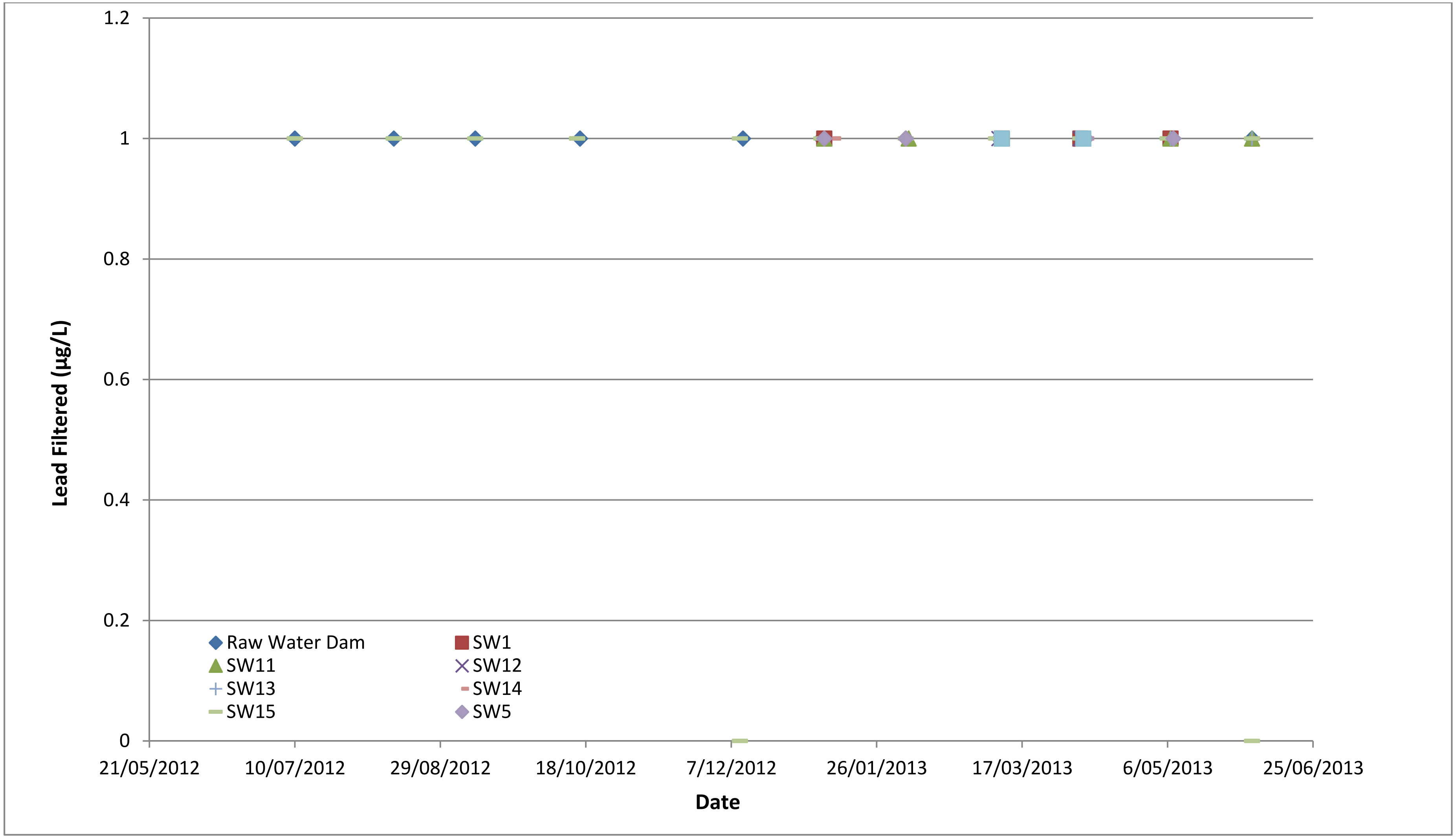

Figure 69 – 0.45 µm Filtered Lead readings at non RP or discharge related sites

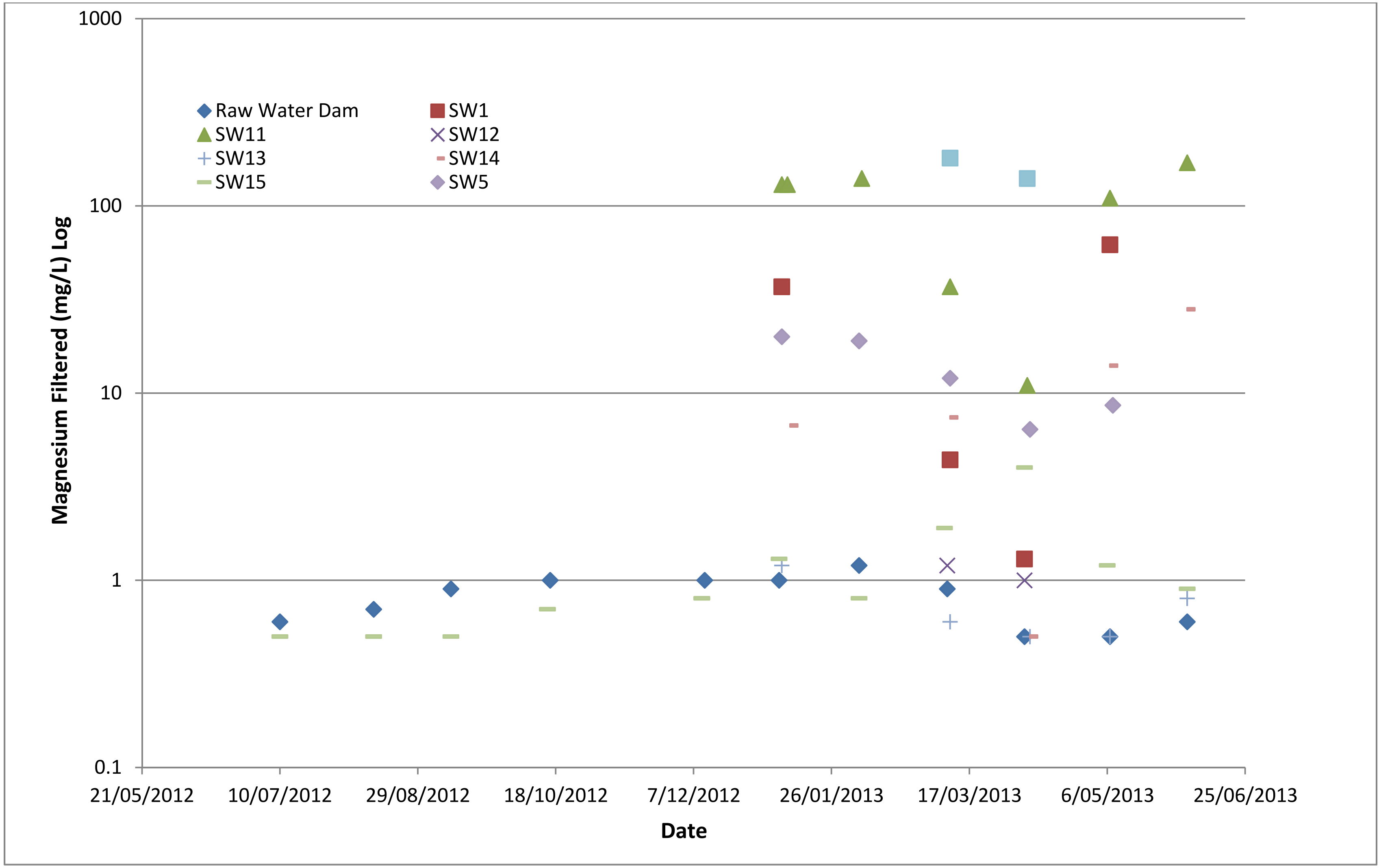

Figure 70 – 0.45 µm Filtered Magnesium readings at non RP or discharge related sites

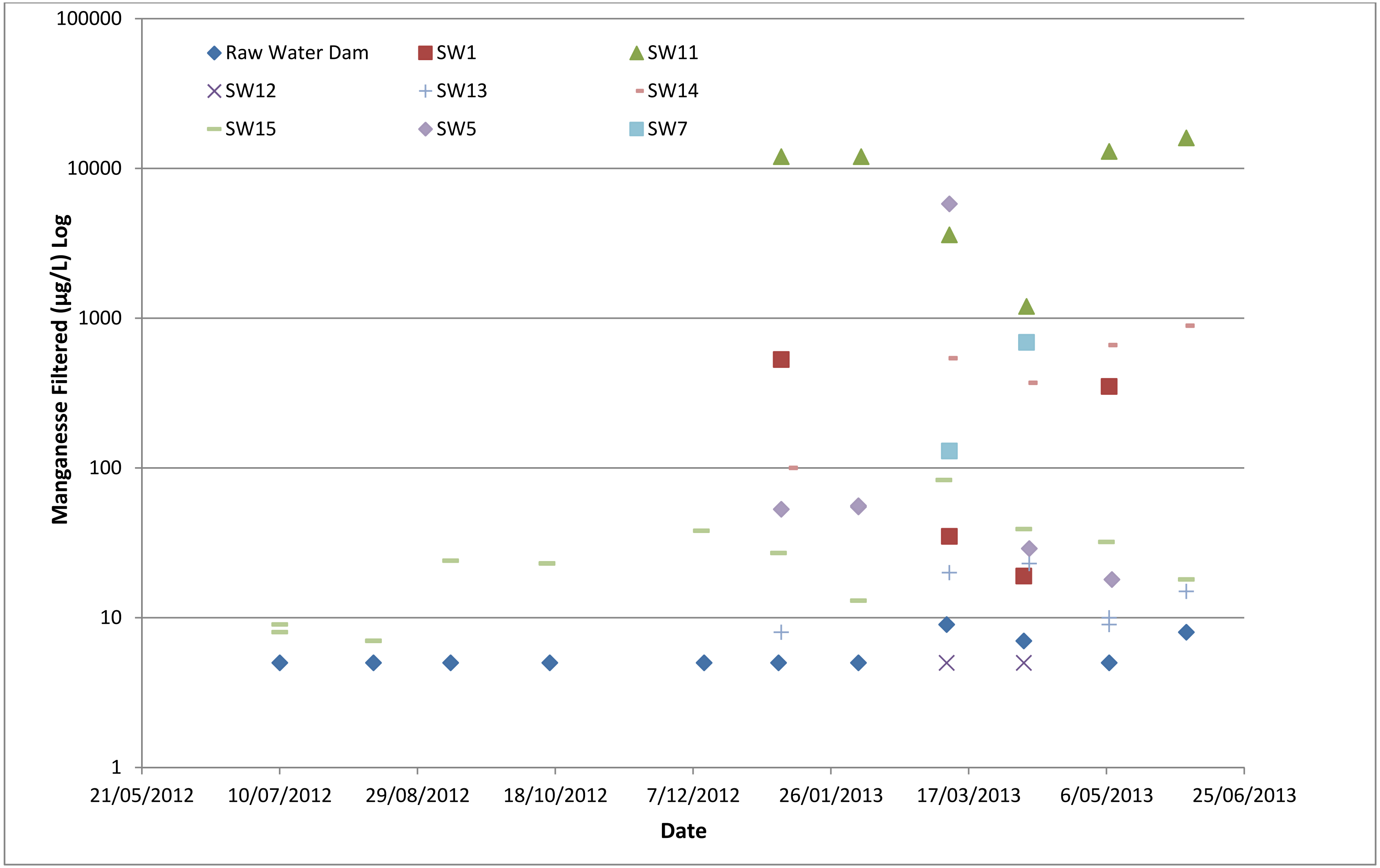

Figure 71 – 0.45 µm Filtered Manganese readings at non RP or discharge related sites

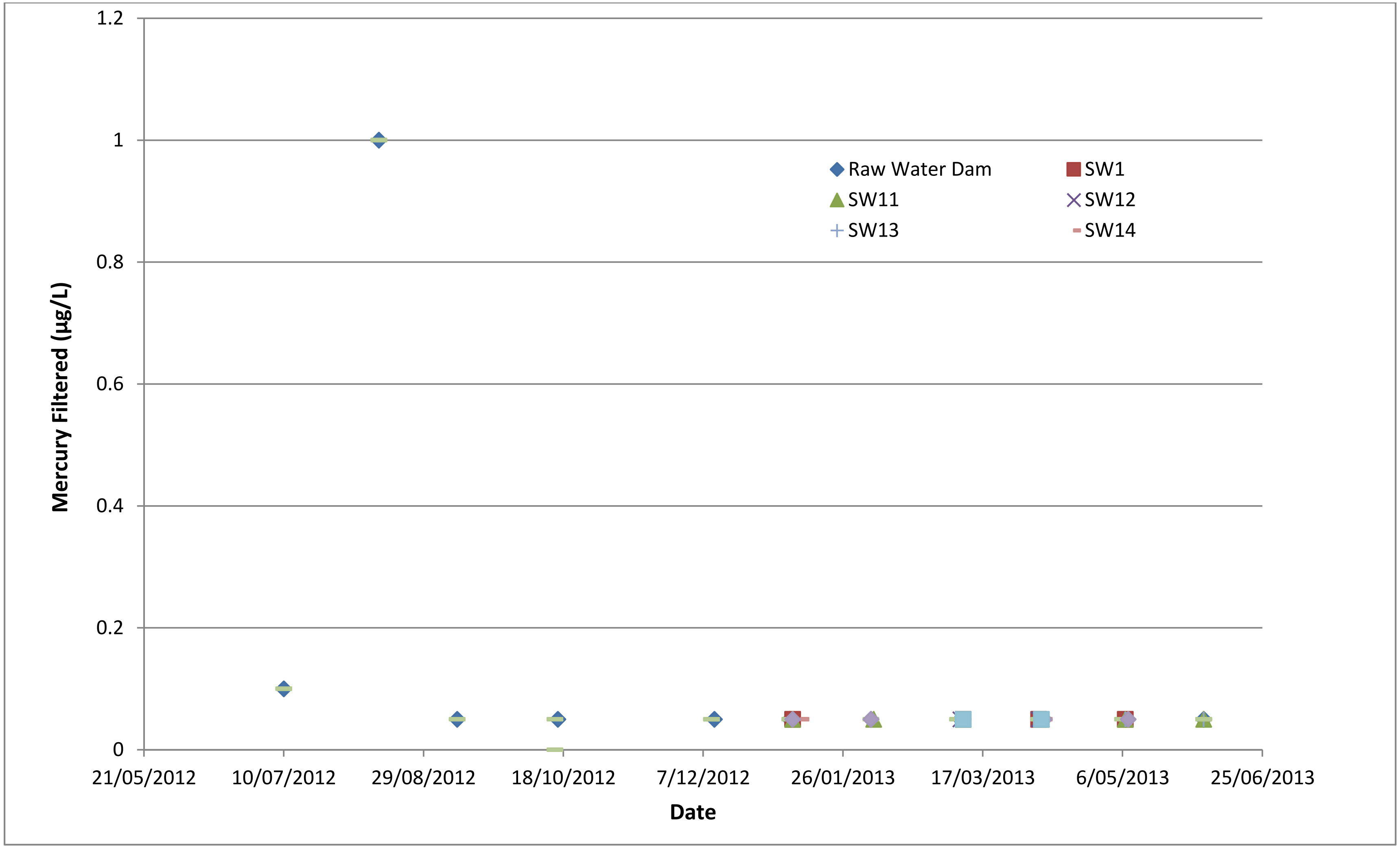

Figure 72 – 0.45 µm Filtered Mercury readings at non RP or discharge related sites

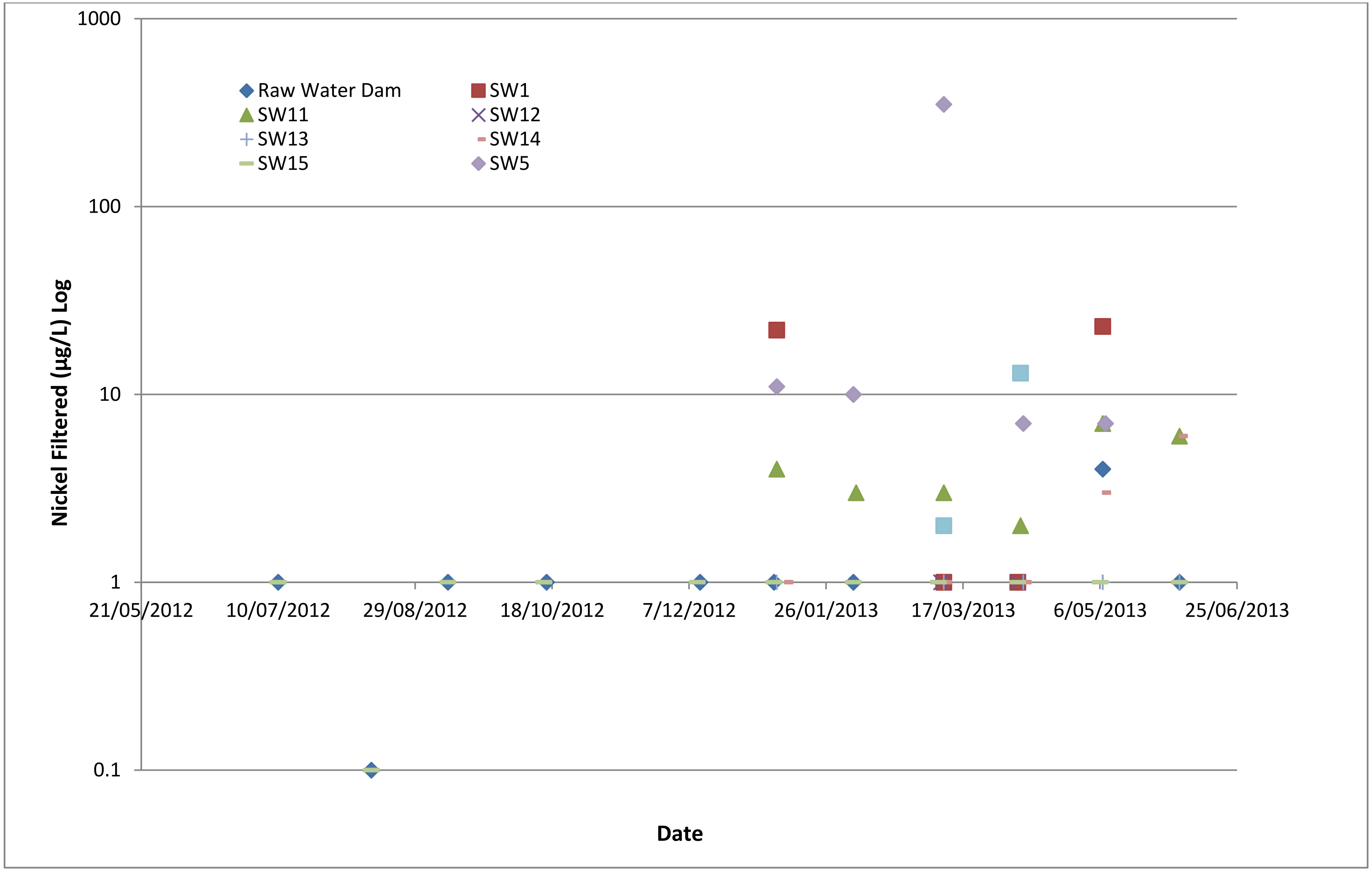

Figure 73 – 0.45 µm Filtered Nickel readings at non RP or discharge related sites

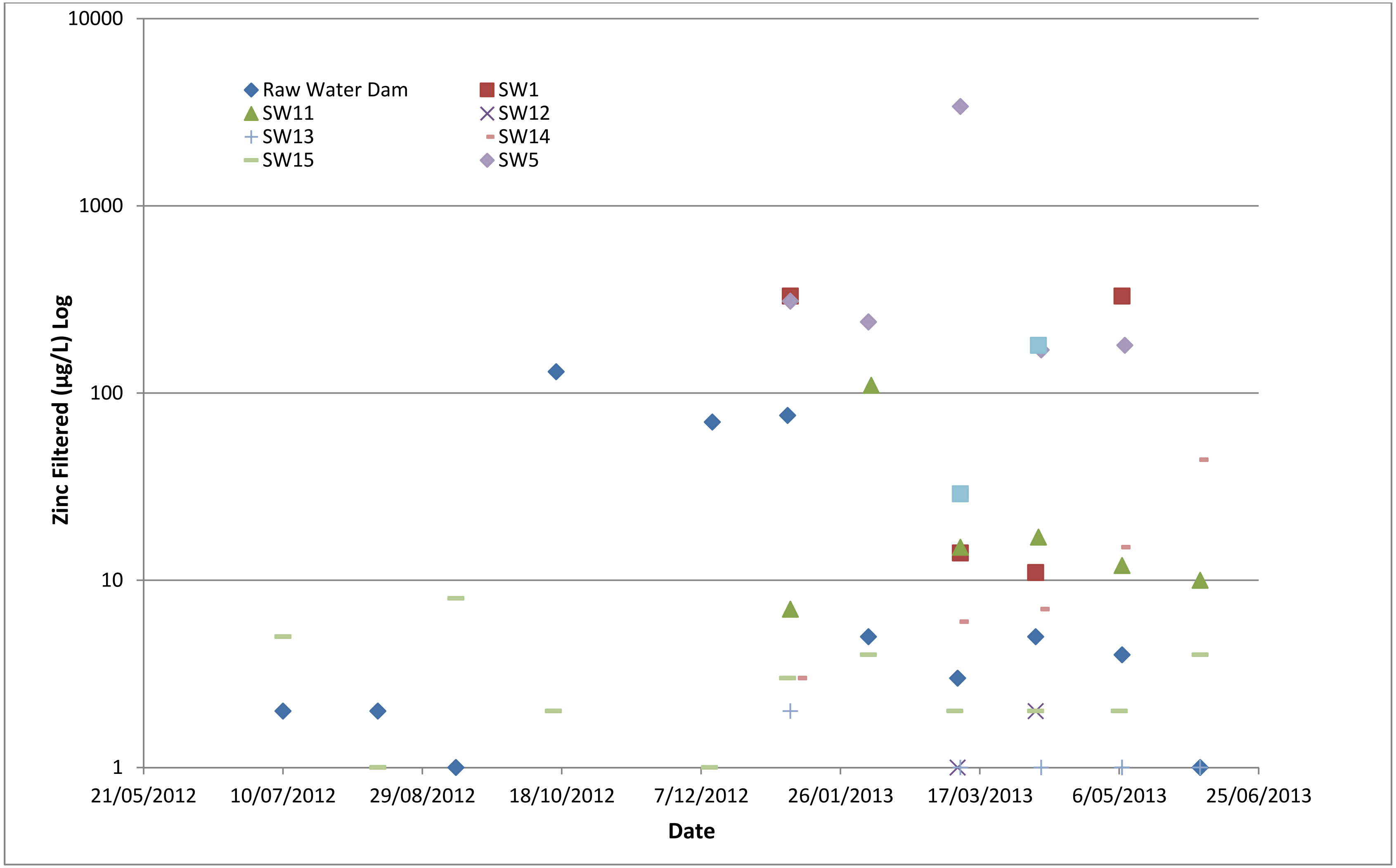

Figure 74 – 0.45 µm Filtered Zinc readings at non RP or discharge related sites

6.5.2 Ground waters

Ground waters are monitored as outlined in section 0. Only one sampling event was undertaken in the previous period. A total of 24 bores sampled in April 2013.

6.5.2.1 Physical quality

pH

The sample results revealed a pH range from 7.22 to 3.25, with the vast majority of bores reporting values between 6 and 7 (Figure 75). The highest pH values were reported by TDMB3D and MB6S, despite the proximity of the bores to RP7 and RP1 respectively. The lowest recorded pH was from TSF2MB01 which is suspected to be due to instrument malfunction rather than a measure of actual aquifer pH

Electrical conductivity

EC readings between the bores varied significantly, and range from 91.9us/cm to a high of 3,979us/cm (Figure **76**). Lower EC readings were generally associated with regional bores with the higher readings dominated by monitoring bores associated with RP1 and RP7.

Dissolved oxygen

DO readings ranged from 0 through 2.99 mg/L (Figure **77**), with all but four bores exhibiting DO levels below 0.15 mg/L. The slightly elevated DO readings recorded were across a mixture of deep and shallow bores. No DO readings were collected for BW6P due to the collection method resulting in aeration of water directly from the existing pump infrastructure.

Temperature

Temperature readings varied over a small range from 29.69 to 34.73 °C (Figure **78**).

Redox

Both oxidising and reducing environments were measured across the site, with redox results varying from negative 26 though to positive 309 (Figure 79) with the bulk of monitoring bores exhibiting oxidising environments in the waters that surround them.

Turbidity

Turbidity readings were variable across the sampled bores, with values ranging from 0 through 309 NTU (Figure **80**). The vast majority of stabilised turbidity readings were between 0 and 33 NTU, with only 2 bores exceeding this value. Due to the poor construction of bores and frequent low recharge rates, maintaining low turbidity values for sampling purposes is often very difficult at the site, even despite specific attempts to reduce pumping rates to less than 200ml per minute. While the turbidity readings reported are those at the time of aquifer stabilisation and sampling, some are unlikely to properly represent actual aquifer turbidity ranges and are more an indication of sediment suspension during sampling activities.

Table 26 - Groundwater physical water quality results for April 2013 groundwater sampling

Bore	pH	Temp	EC	Turbidity	DO	Redox
	units	°C	us/cm	NTU	mg/L	mV
BW17P	6.42	32.41	410	171.5	0.03	172
BW19P	6.04	31.8	329	10.5	0.12	208
BW29	5.96	29.46	91.9	22.2	0	267
BW5	6.2	31.9	173.9	0.5	0.1	184
BW6P	6.58	34.73	1018	0	2.99	198
MB01	6.43	32.71	555	0.1	0.13	212
MB3	6.37	31.72	1870	0.7	0.06	-15
MB4	6.86	32.44	792	1.23	0.02	-26
MB5	6.63	31.04	1381	216	0	141
MB6D	6.45	32.06	3362	11.1	0	155
MB6S	7.17	30.15	3112	3.4	0.02	217
MB7D	6.48	31.57	2893	11.3	0	154
MB7S	6.94	29	2956	23.3	0.77	266
SW04MB01	6.3	30.7	241	3.8	0.01	242
TDMB1D	6.66	32.22	2408	0	0	58
TDMB2D	7.01	30.6	3979	9.7	0	44
TDMB2S	6.71	26.69	2527	1	0.79	124
TDMB3D	7.22	29.89	183.7	8.4	0	129
TDMB4D	6.5	31.2	255	30.2	0.1	126
TDMBD1	6.54	32	310	0	0.6	
TSF2MB01	3.25	33.36	1462	8	0	248
TSF2MB02	6.08	33.27	290	1.8	0.02	309
WDMB01	6.3	32.6	740.5	1.8	0	181.8
WDMB02	6.6	31.72	878	6.7	0.06	172
Maximum	7.22	34.73	3979	216	2.99	309
Minimum	3.25	26.69	91.9	0	0	-26
Average	6.40	31.47	1342.42	22.63	0.24	163.77

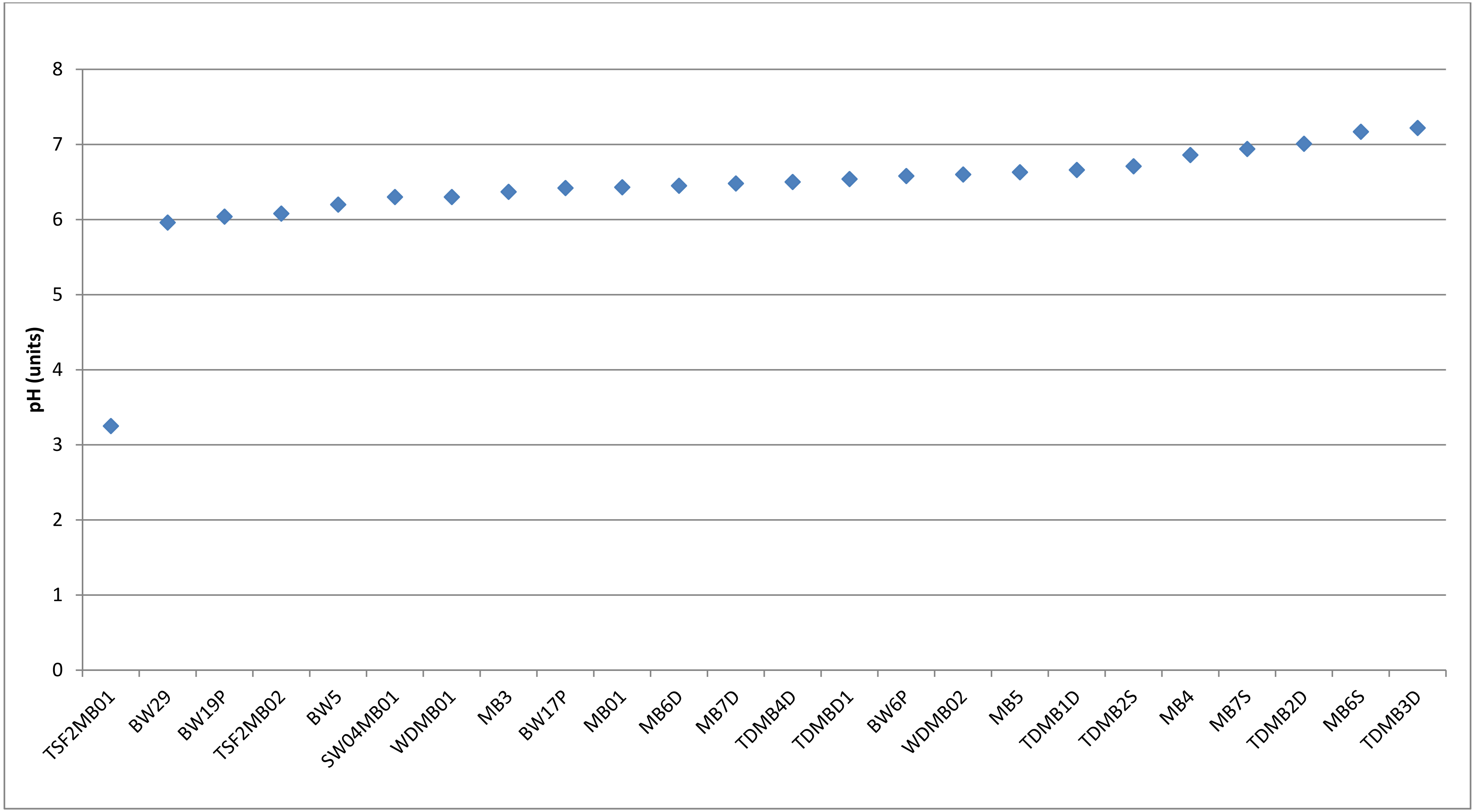

Figure 75 – Ordered stabilised pH readings from bores sampled in April 2013

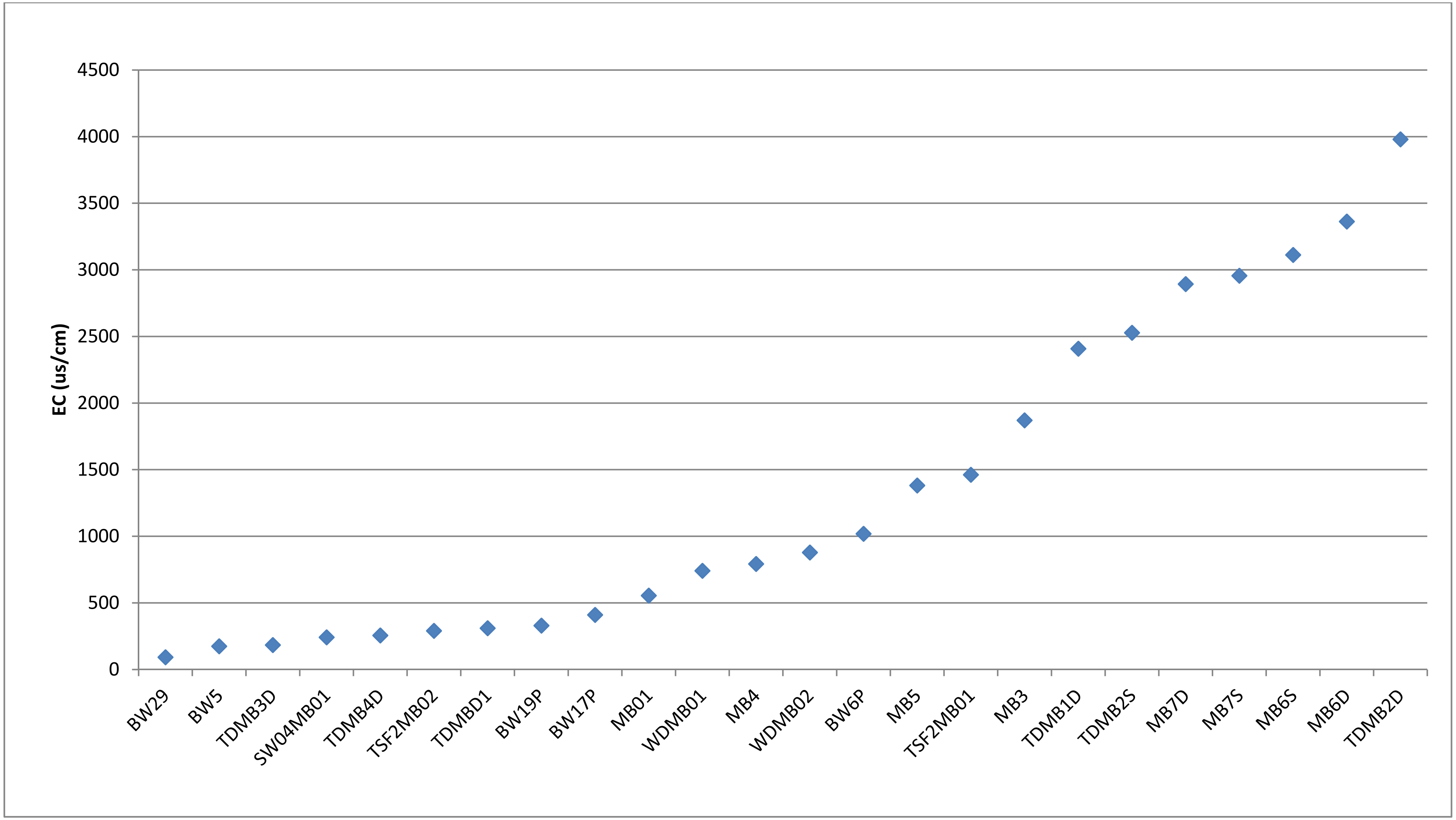

Figure 76 – Ordered stabilised electrical conductivity readings for bores sampled in April 2013

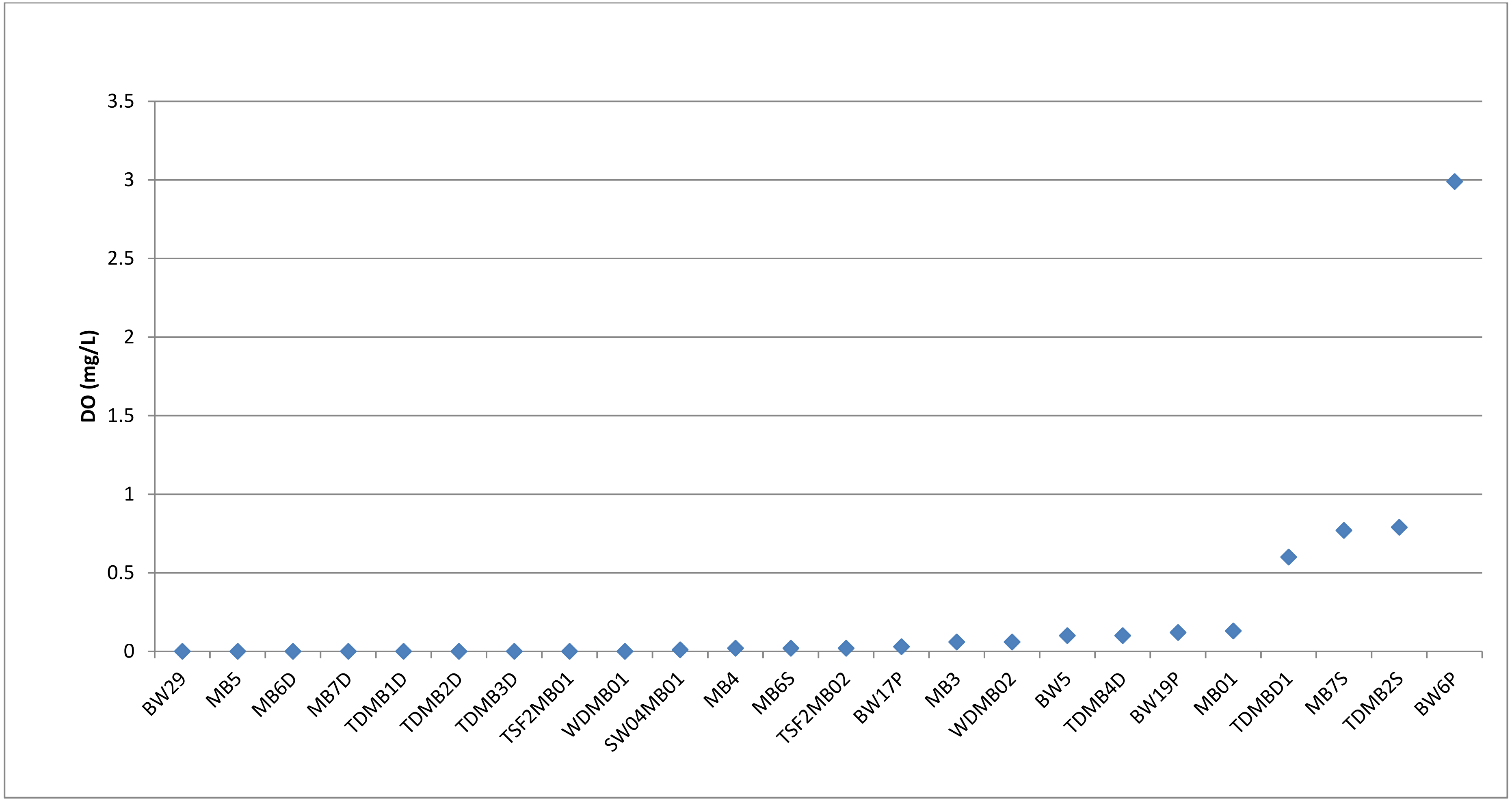

Figure 77 – Ordered stabilised dissolved oxygen readings for bores sampled in April 2013

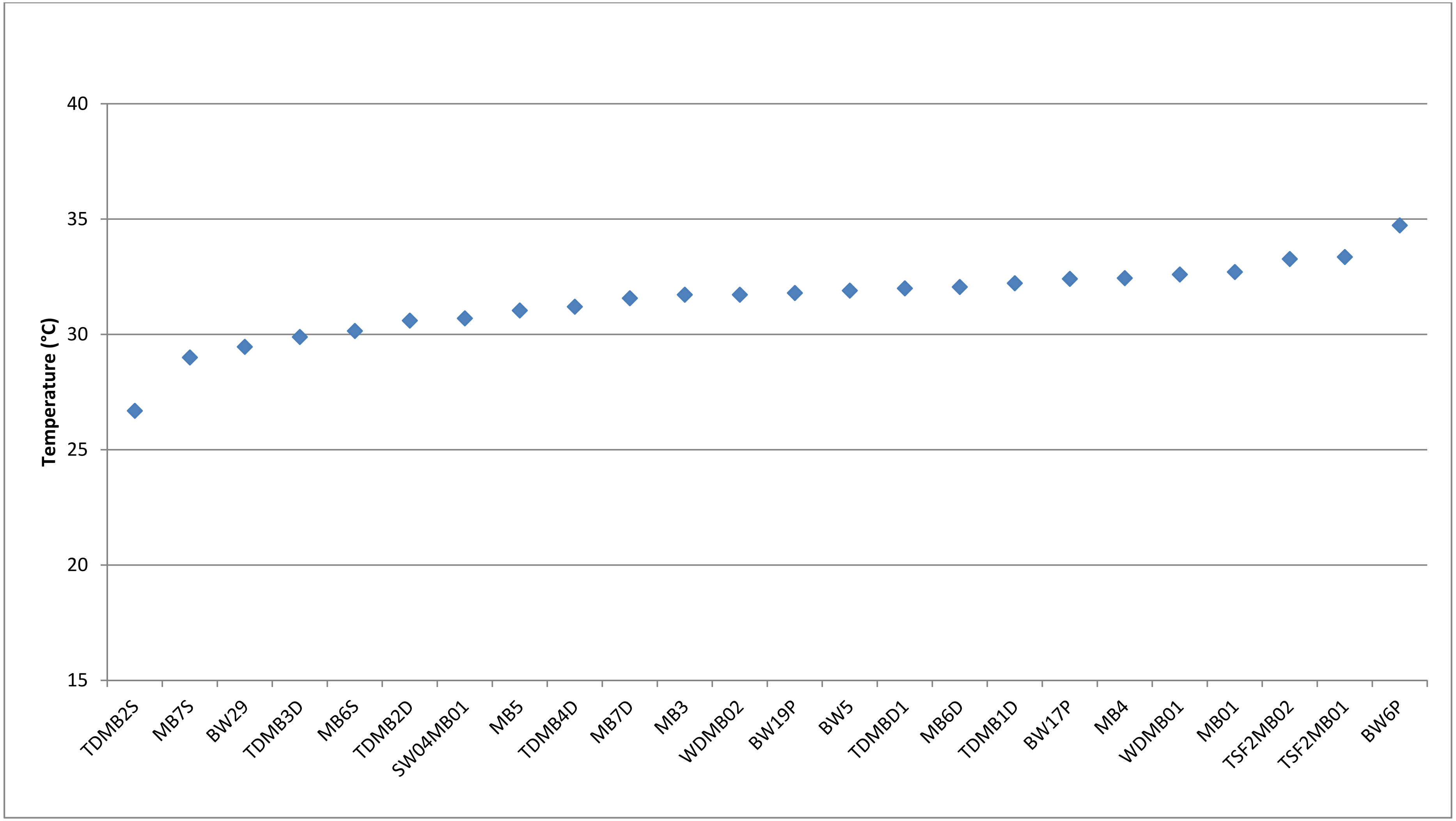

Figure 78 – Ordered stabilised temperature readings for bores sampled in April 2013

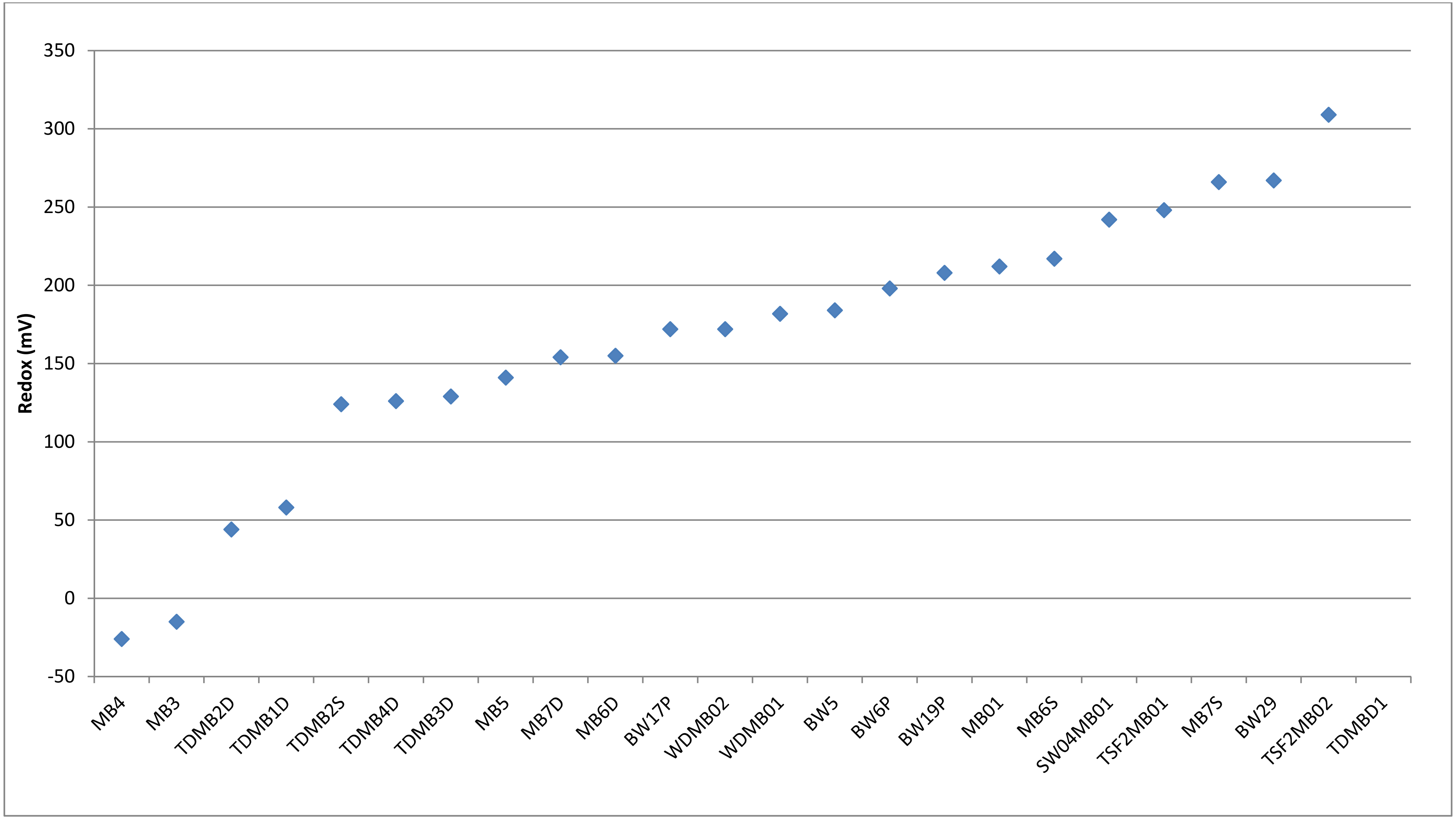

Figure 79 – Ordered stabilised redox readings for bores sampled in April 2013

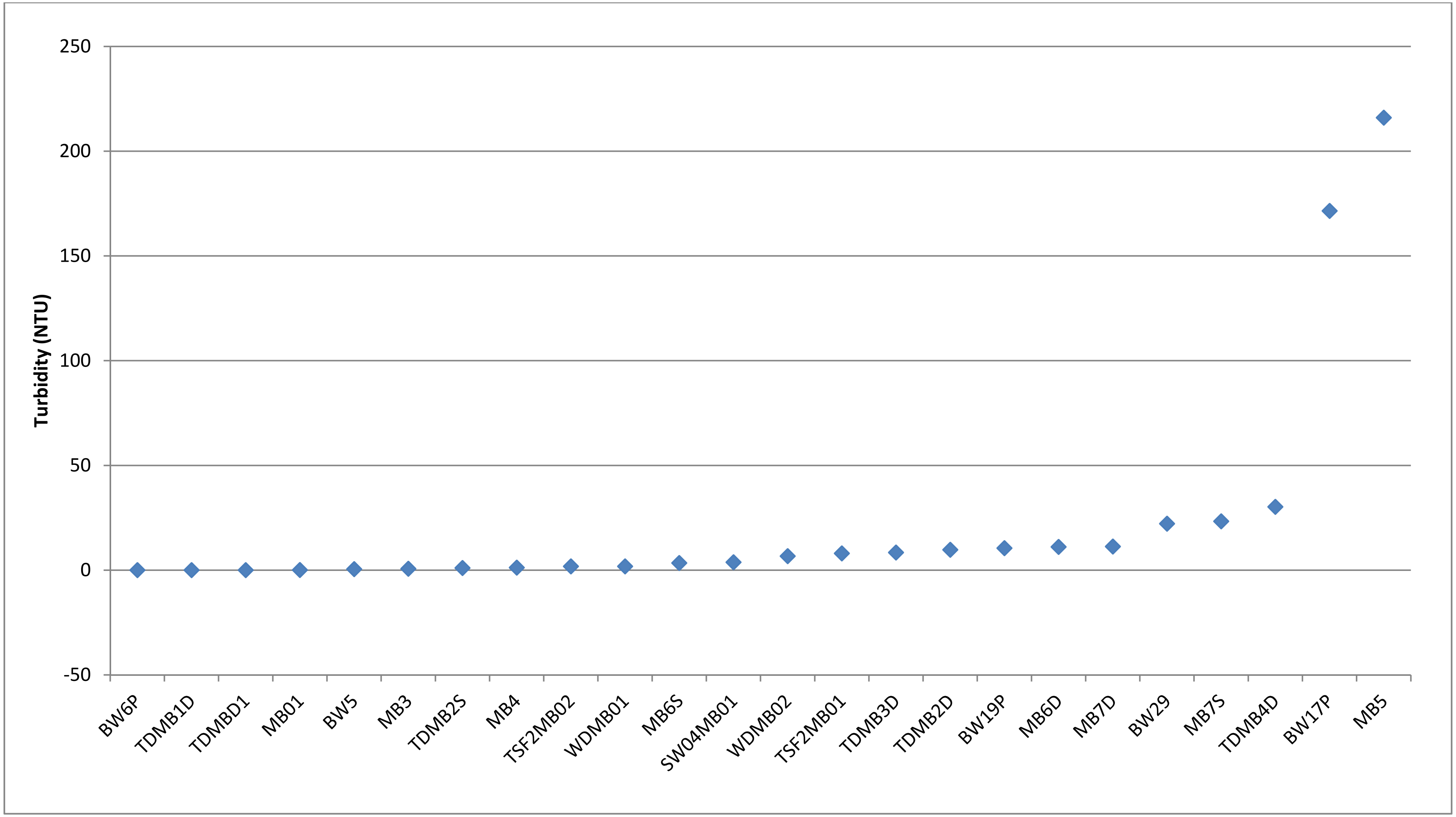

Figure 80 - Ordered stabilised turbidity readings for bores sampled in April 2013

6.5.2.2 Chemical quality

Out of the 65 elements analysed by the laboratory 55 were detected in at least 1 sample above the LOR. Elements less than LOR and not present in the groundwater in any samples include –

- Hydroxide Alkalinity
- Carbonate Alkalinity as $CaC0_3$
- Silver (filtered)
- Beryllium (filtered)
- Bismuth (filtered)
- Selenium (filtered)
- Chromium (filtered)
- Titanium (filtered)
- Thallium (filtered)
- Vanadium (filtered)

Low concentrations and occurrence of the following elements was also reported

- Cyanate
- Nitrite
- Nitrate
- Aluminium (Dissolved)
- Cadmium(Filtered)
- Molybdenum (Filtered)
- Lead (Filtered)
- Antimony (Filtered)
- Tin (Filtered)
- Mercury (filtered)
- Lead (filtered)

Cyanide was detected in four sampled bores (Figure 81), TDMB2D, TDMB2S and TDMB1D are located below the TSF, and MB5 slightly further south of TDMB1D. The deep bores of this set range from 12.5 to 25m and provide clear evidence of the extent of seepage from the TSF as the presence of cyanide in the results is a clear signature of the chemistry of the TSF during operations.

Figure 82 illustrates the range of groundwater arsenic concentrations across the site. Arsenic was measured in all but 4 bores, with levels exceeding 150 µg/L in 7 bores located around the TSF, waste rock dump and in natural undisturbed areas north of the site.

Sulphate concentrations were mixed across the site with only half of the bores samples returning noticeable increased concentrations. The highest concentrations up to a maximum of 2500 µg/L were present in the RP1 and RP7 adjacent bores.

Groundwater monitoring bores close to RP3 do not currently exhibit any chemical signatures which indicate the movement of contaminated waters away from the pit. From current hydrogeological investigations monitoring more MB1 is assumed to be downstream of RP3 at 136m spatial separation, but does not exhibit any measurable concentrations of contaminants similar in ratio to those prior to the treatment of RP3.

A tabulated list of the chemical results in presented in Appendix I

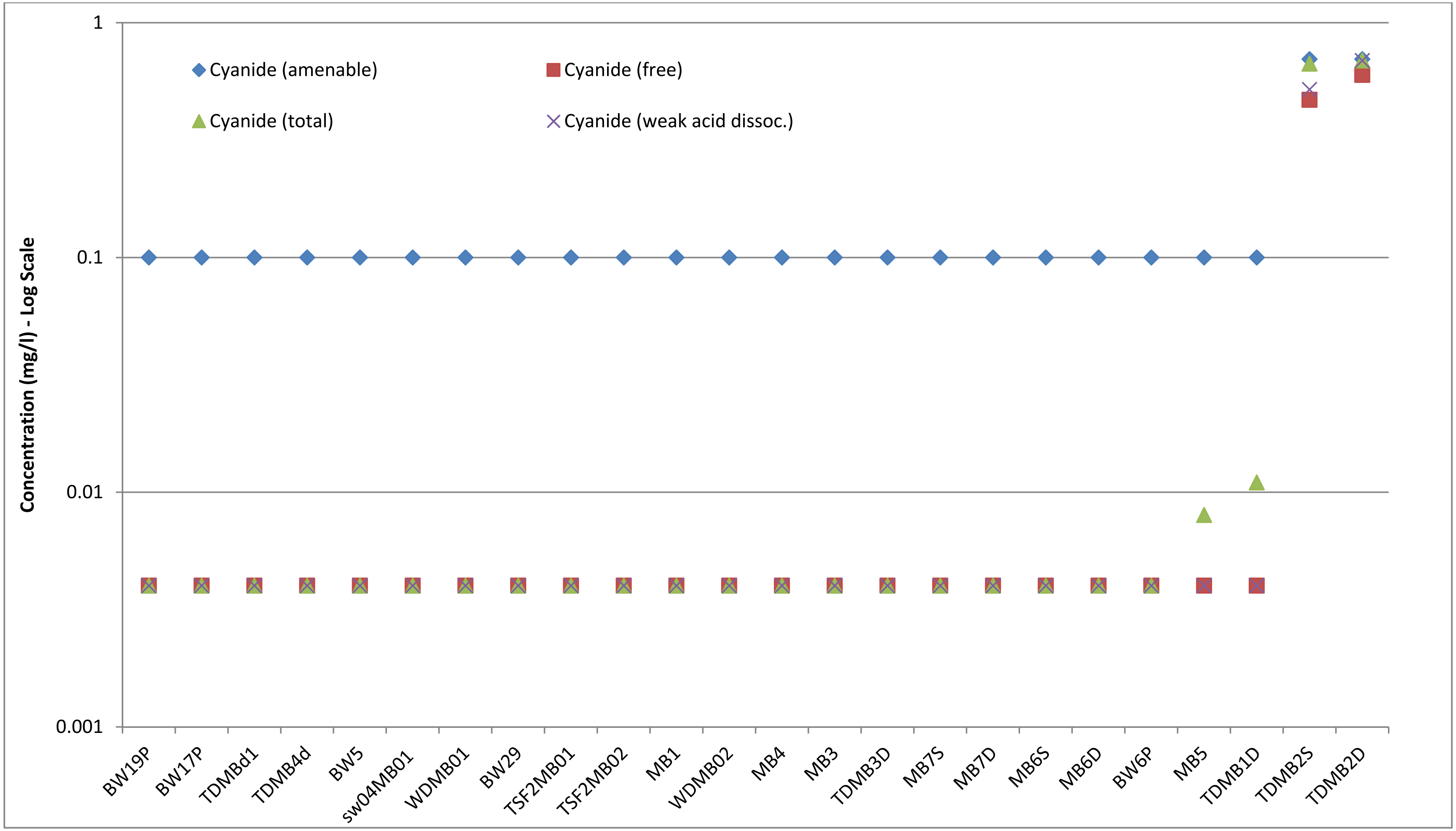

Figure 81 – Ordered Cyanide distribution and concentrations

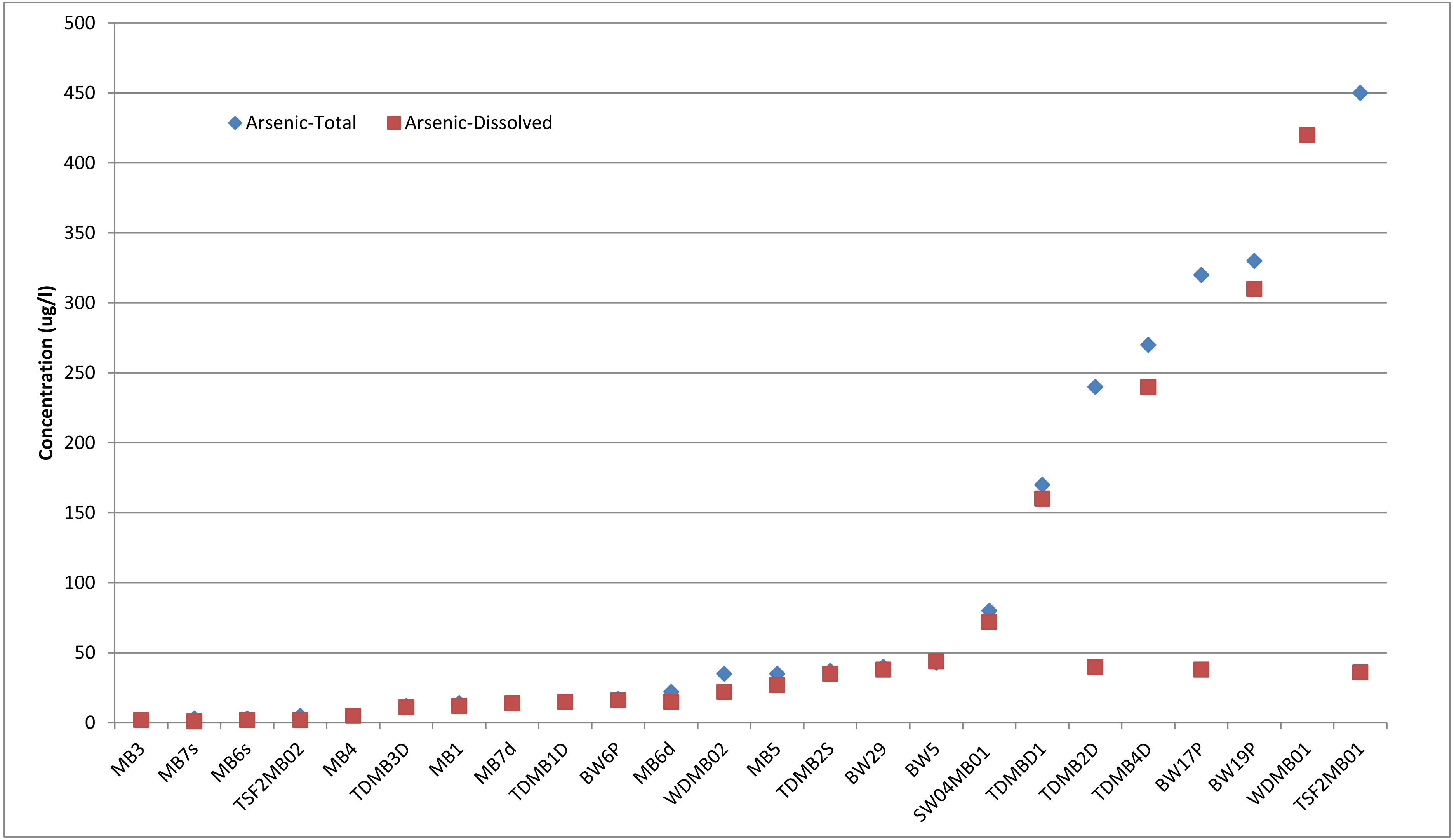

Figure 82 – Ordered Arsenic dissolved and total concentrations

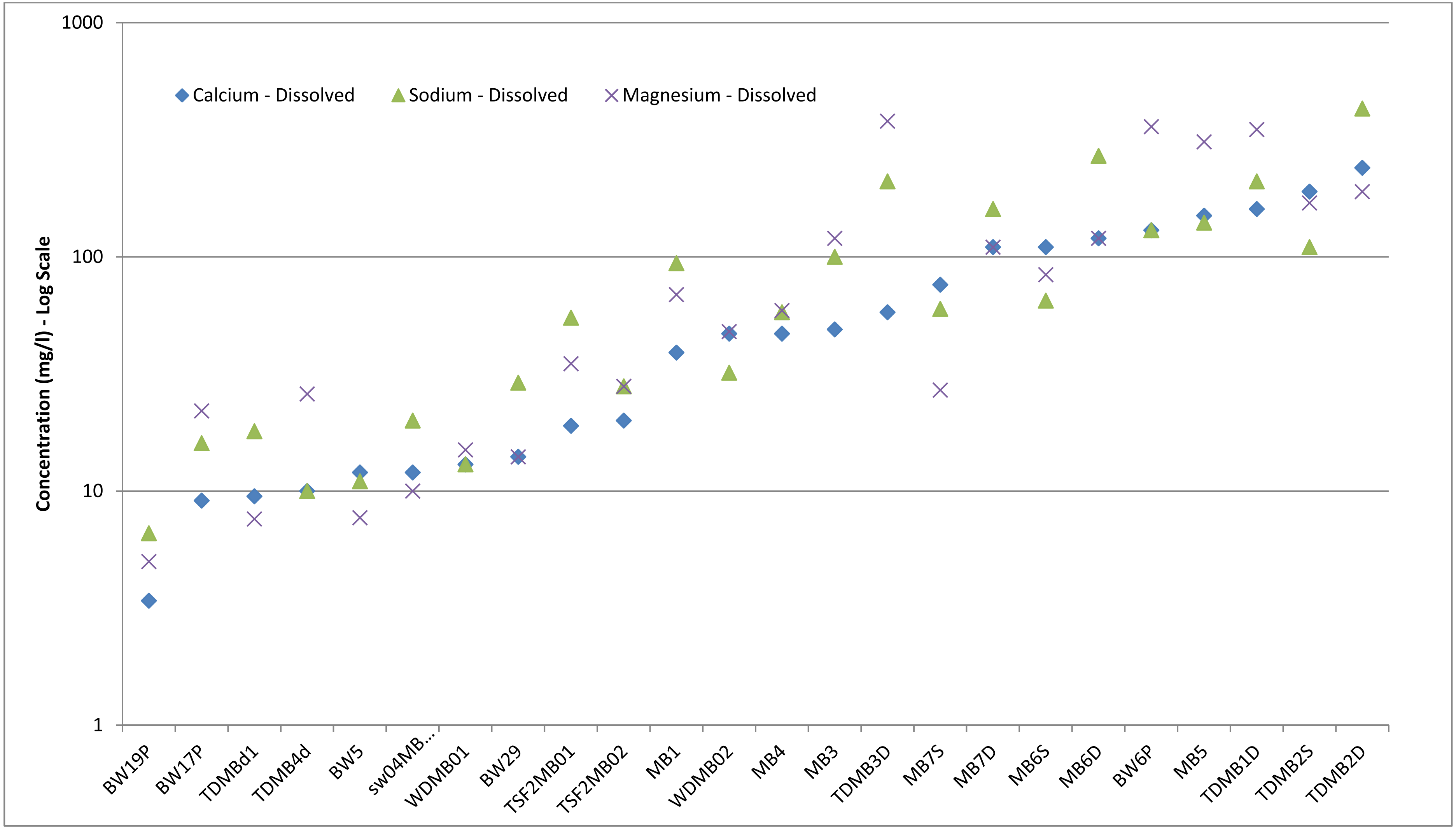

Figure 83 - Ordered Calcium, Sodium and Magnesium concentrations

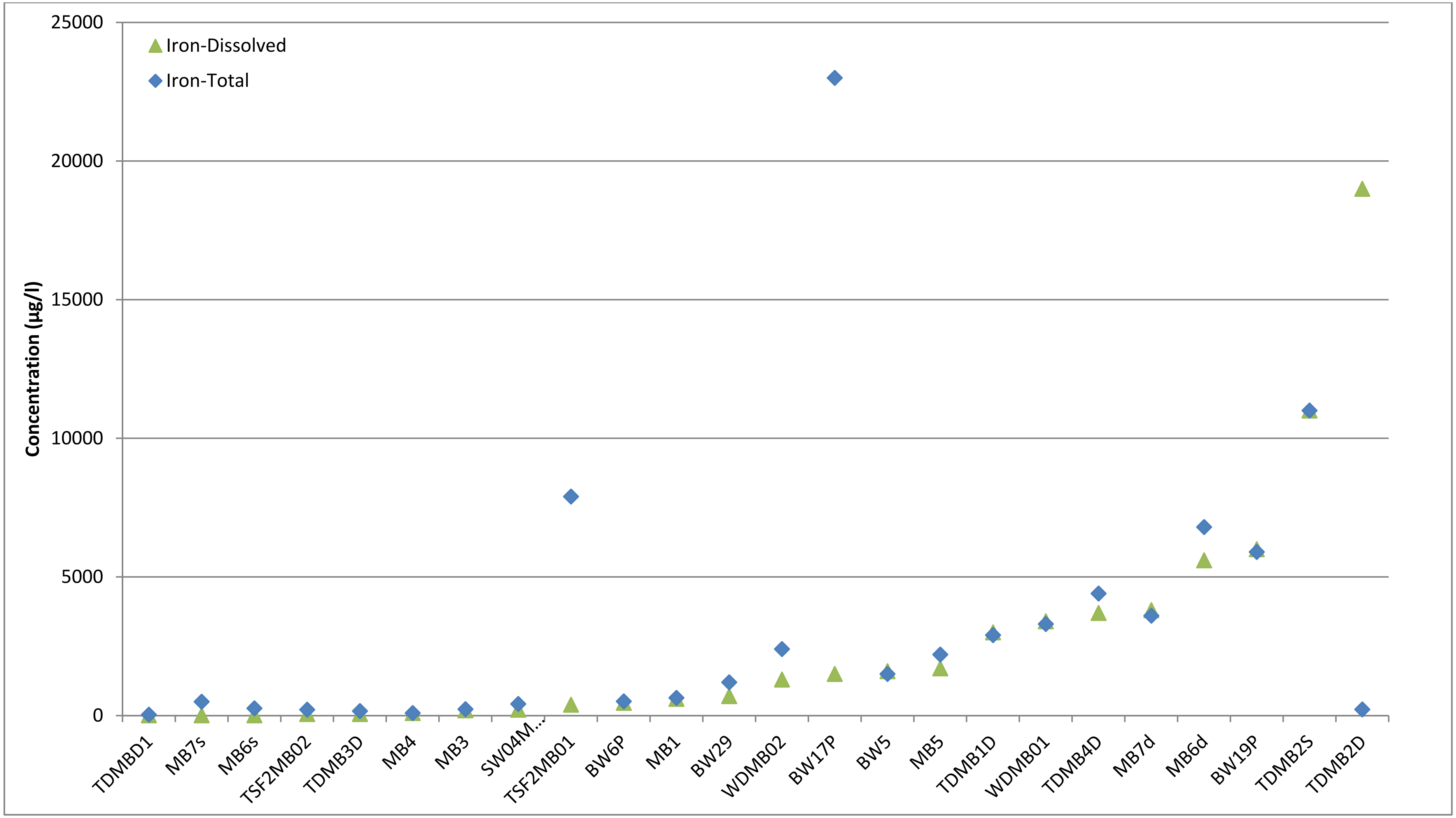

Figure 84 - Ordered dissolved and total Iron concentrations

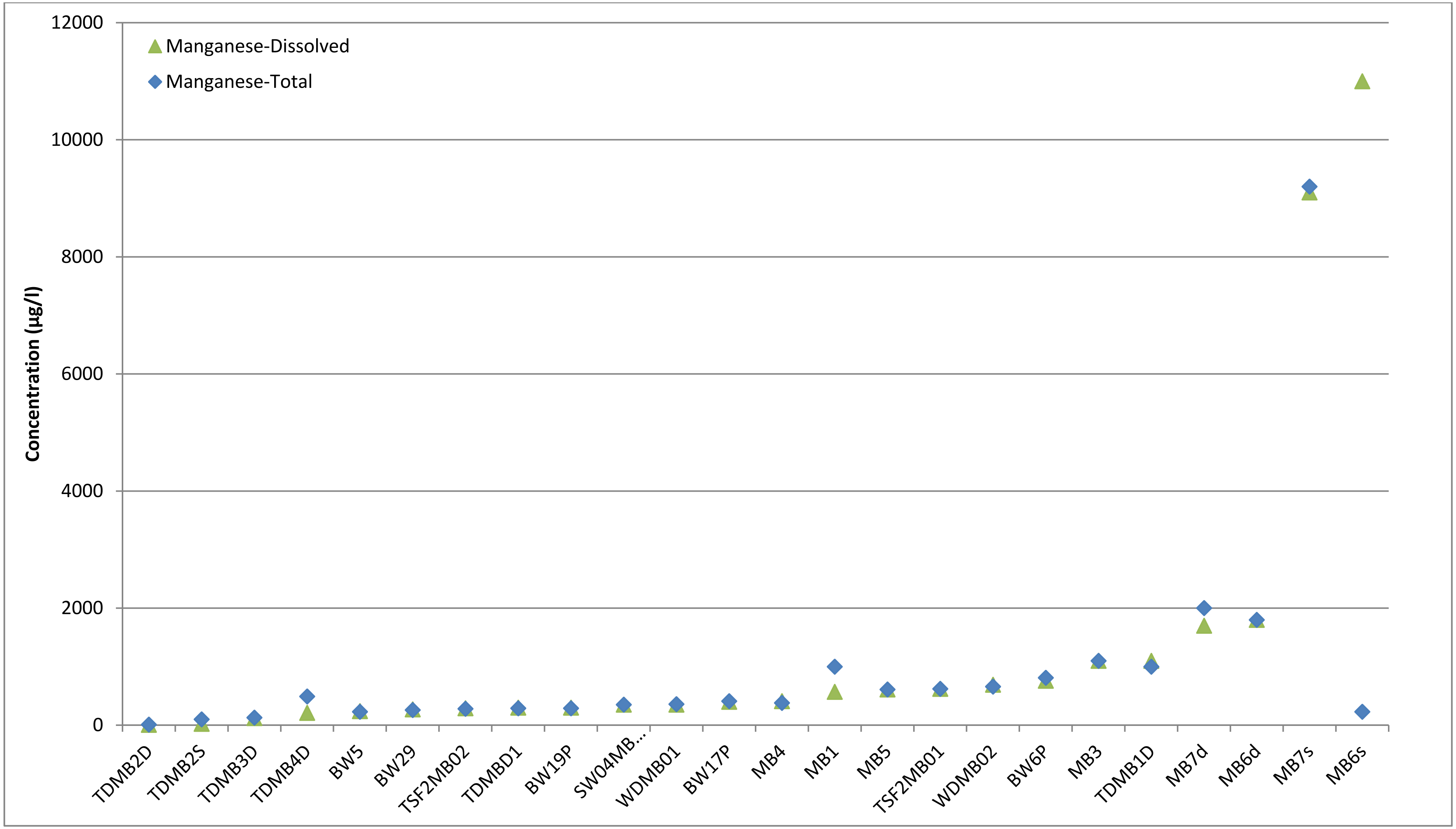

Figure 85 - Ordered Manganese totals and dissolved concentrations

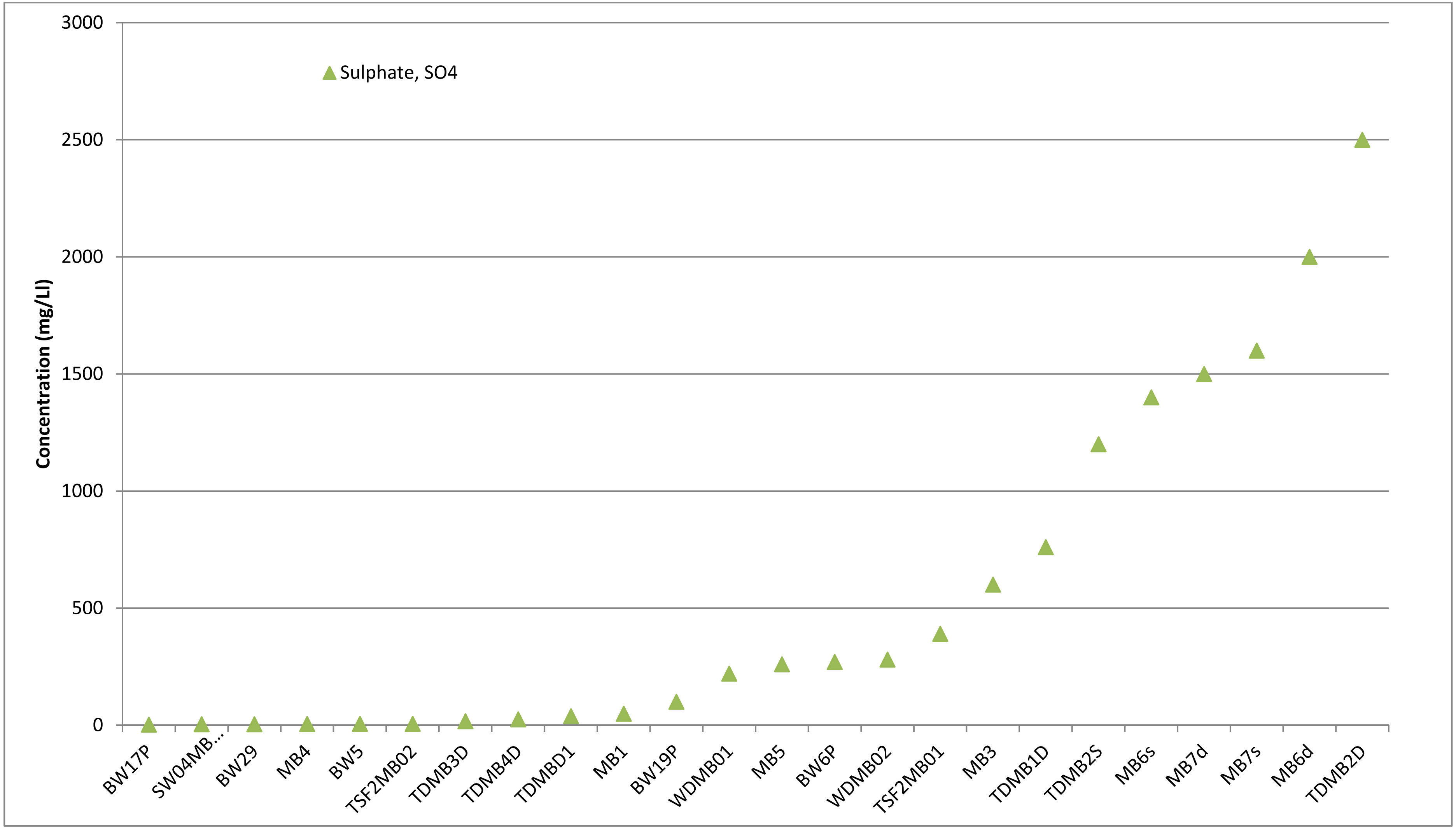

Figure 86 - Ordered Sulphate concentrations

6.5.2.3 Discussion of chemical results

In general groundwater contamination appears to be limited to the immediate area of the site and to respective retention ponds. Down gradient bores such as SW4MB01, BW29P and BW6 do not exhibit concentrations of elements with signatures of legacy mining structures. The results do clearly indicate that retention ponds such as RP7 and RP1 are seeping into the ground waters immediately below each structure but the wider extent of such seepage is unknown due to the limited spatial availability of monitoring bores. Such issues are currently under consideration by Vista Gold and will be taken into account during further site developments.

An assessment of the long term changes in element concentrations across the site has not been undertaken in this WMP. Vista Gold will aim assess the longer term groundwater variability, using available data and records from multiple agencies, and include such assessments within the forthcoming period.

Assessment against ANZECC guidelines or factors such as drawdown have also not been conducted as significant groundwater is not currently extracted and used for operations while under care and maintenance.

6.6 Water account

The water accounting for the 2012-13 period maintains the format as presented in prior years. Vista Gold will commence water accounting as per the Minerals Council of Australia framework upon commencement of mining operations. Reporting against the framework while in care and maintenance mode is considered to be of little benefit when there are no operations which involve the consumption of water or impacts on external parties as a result of such non consumption.

6.6.1 Water account for the previous period

A summary of onsite water transfers during the 2012-13 period is presented in Table 27. Due to limited data and resolution of available data available for precise calculations, the numbers within the table should be used as a guide only as many have been estimated or deduced by indirect methods.

Table 27 - Water balance summary for 2011-12

LOCATION	INFLOWS	ML/yr	OUTFLOWS	ML/yr
RP1 Catchment	Rainfall	2270.13	Adsorption/Evaporation	835.78
			RP1	1434.35
	TOTAL	2270.13	TOTAL	2270.13
RP1	Rainfall	660.82	Siphons to Edith River	2.25
	RP1 Catchment Runoff	1434.35	Pump to RP7	429.90
			Pump to RP3	437.70
			Evaporation	829.82
			Δ Storage	395.49
	TOTAL	2095.17	TOTAL	2095.17
RP2 Catchment	Rainfall	429.87	Adsorption/Evaporation	216.85
			RP2	213.02
	TOTAL	429.87	TOTAL	429.87
RP2	Rainfall	5.24	Pump to RP3	50.60
	RP2 Catchment Runoff	213.02	Pump to RP7	192.08
	Pumping from RP5	40.69	Spillway	10.00
			Evaporation	6.58
			Δ Storage	-0.31
	TOTAL	258.95	TOTAL	258.95
RP3 Catchment	Rainfall	436.84	Adsorption/Evaporation	295.70
			RP3	141.14
	TOTAL	436.84	TOTAL	436.84
RP3	Rainfall	394.79	Evaporation	495.76
	RP3 Catchment Runoff	141.14		
	Treated from RP1	344.60	Δ Storage	528.86
	Untreated from RP1	7.72		

	Pump from RP2 Pump from HL Pond Pump from WTP TOTAL	50.60 0.39 85.38 1024.62	TOTAL	1024.62
RP5 Catchment	Rainfall TOTAL	457.14 457.14	Adsorption/Evaporation RP5 TOTAL	407.74 49.40 457.14
RP5	Rainfall RP5 Catchment Runoff TOTAL	9.67 49.40 59.08	Pump to RP2 Pump to RP7 Evaporation Δ Storage TOTAL	40.69 9.74 12.15 -3.50 59.08
RP7 Catchment	Rainfall TOTAL	874.55 874.55	Adsorption/Evaporation RP7 TOTAL	769.55 105.00 874.55
RP7	Rainfall RP7 Catchment Runoff Pump from HLP Pump from RP1 Pump from RP2 Pump from RP5 Pump from RP1 treated TOTAL	2304.50 105.00 92.00 290.17 92.08 8.39 1.73 2893.87	Evaporation Δ Storage TOTAL	2893.87 -40.22 2853.65
HL POND	Rainfall Runoff/Seepage from HL Pad TOTAL	30.96 437.21 468.17	Evaporation Evaporation Off Pad Pump to RP3 Pump to RP7 Δ Storage TOTAL	38.88 209.17 0.11 220.01 -0.82 468.17

6.6.2 Water account for the upcoming period

As outlined in section 0 the onsite water management activities, particularly for the 2013-14 period, will be largely consistent with previous years. While all available opportunities will be taken to release onsite waters as per allowable criteria of WDL-178-3, it is expected that the net result by the end of the 2013-14 wet season will probably be a further increase to the total AMD site inventory.

With the available onsite storage capacity nearing exhaustion, the lifespan of the current strategy is limited to no more than two years. Vista Gold acknowledges that without alteration of the existing water management strategy, further delay of pit dewatering activities will be impossible. The company is currently investigating all options (financial, operational etc.) which could contribute towards the reduction of annual ARD accumulation and shift of the site more towards a neutral water balance until dewatering activities can recommence. Any significant changes to the planned water management strategy to that outlined in this plan will be resubmitted as an appropriate amendment.

If dewatering activities were to commence within the life of plan the volumes of water which could be discharged from site and the number of years required to completely empty RP3, based on various levels of allowable dilution, are calculated in Table 28 through Table 30.

Table 28 - Calculated discharge volumes from RP3 at various dilution rates based on 10 years of actual Edith River flow

			1:200		1:100		1:50		1:25		1:15		1:10		1:5		1:2	
Wet Season	Annual Total Edith River Flow (GL)	Cumulative Annual Edith River Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)
2000-1	329.483	329.483	1.23	1.23	2.55	2.55	4.29	4.29	6.43	6.43	7.98	7.98	9.06	9.06	10.98	10.98	15.34	15.34
2001-2	231.647	561.130	0.70	1.93	1.23	3.78	2.14	6.43	3.44	9.87	4.61	12.59	5.86	14.92	8.53	19.52	13.68	29.02
2002-3	221.042	782.172	0.94	2.87	1.88	5.66	3.11	9.54	4.37	14.24	5.15	17.74	5.75	20.67	6.50	26.01	7.12	36.14
2003-4	491.803	1273.975	1.99	4.87	3.79	9.45	6.84	16.38	9.78	24.02	11.86	29.60	13.86	34.53	23.53	49.54	26.10	62.24
2004-5	74.814	1348.789	0.19	5.06	0.47	9.92	0.96	17.34	1.83	25.86	2.74	32.34	3.63	38.15	5.50	55.04	8.70	70.94
2005-6	324.495	1673.283	1.18	6.24	2.34	12.26	4.19	21.53	6.81	32.67	8.59	40.92	10.32	48.47	13.19	68.24	16.14	87.08
2006-7	197.904	1871.187	0.70	6.94	1.42	13.68	2.71	24.24	4.25	36.92	5.60	46.52	6.90	55.37	9.81	78.04	15.02	102.10
2007-8	290.069	2161.256	1.10	8.04	2.09	15.77	3.62	27.85	5.46	42.37	6.77	53.29	7.99	63.36	10.12	88.16	13.32	115.42
2008-9	346.637	2507.893	1.35	9.40	2.63	18.40	4.35	32.20	6.20	48.57	7.23	60.51	7.80	71.16	8.92	97.09	11.85	127.26
2009-10	125.863	2633.756	0.39	9.78	0.95	19.34	1.91	34.11	3.26	51.82	4.43	64.95	5.60	76.75	7.90	104.99	11.61	138.87

Table 29 - Calculated discharge volumes from RP3 at various dilution rates based on 10 years of ascending annual flow volumes

			1:200		1:100		1:50		1:25		1:15		1:10		1:5		1:2	
Wet Season	Annual Total Edith River Flow (GL)	Cumulative Annual Edith River Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)
2004-5	74.81376602	74.814	0.19	0.19	0.47	0.47	0.96	0.96	1.83	1.83	2.74	2.74	3.63	3.63	5.50	5.50	8.70	8.70
2009-10	125.8626315	200.676	0.39	0.58	0.95	1.41	1.91	2.87	3.26	5.09	4.43	7.17	5.60	9.22	7.90	13.40	11.61	20.31
2006-7	197.9038439	398.580	0.70	1.28	1.42	2.83	2.71	5.58	4.25	9.34	5.60	12.77	6.90	16.12	9.81	23.21	15.02	35.32
2002-3	221.0422206	619.622	0.94	2.23	1.88	4.71	3.11	8.69	4.37	13.71	5.15	17.92	5.75	21.87	6.50	29.71	7.12	42.45
2001-2	231.6467327	851.269	0.70	2.93	1.23	5.94	2.14	10.84	3.44	17.15	4.61	22.53	5.86	27.72	8.53	38.24	13.68	56.13
2007-8	290.0689468	1141.338	1.10	4.03	2.09	8.03	3.62	14.46	5.46	22.61	6.77	29.30	7.99	35.71	10.12	48.36	13.32	69.45
2005-6	324.494513	1465.833	1.18	5.21	2.34	10.37	4.19	18.64	6.81	29.42	8.59	37.88	10.32	46.03	13.19	61.55	16.14	85.59
2000-1	329.4831384	1795.316	1.23	6.44	2.55	12.92	4.29	22.93	6.43	35.85	7.98	45.86	9.06	55.10	10.98	72.54	15.34	100.92
2008-9	346.6370936	2141.953	1.35	7.79	2.63	15.55	4.35	27.28	6.20	42.04	7.23	53.09	7.80	62.89	8.92	81.46	11.85	112.77
2003-4	491.8030095	2633.756	1.99	9.78	3.79	19.34	6.84	34.11	9.78	51.82	11.86	64.95	13.86	76.75	23.53	104.99	26.10	138.87

Table 30 - Calculated discharge volumes from RP3 at various dilution rates based on 10 years of descending annual flow volumes

			1:200		1:100		1:50		1:25		1:15		1:10		1:5		1:2	
Wet Season	Annual Total Edith River Flow (GL)	Cumulative Annual Edith River Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)	Annual Flow (GL)	Cumulative Annual Flow (GL)
2003-4	491.8030095	491.803	1.99	1.99	3.79	3.79	6.84	6.84	9.78	9.78	11.86	11.86	13.86	13.86	23.53	23.53	26.10	26.10
2008-9	346.6370936	838.440	1.35	3.35	2.63	6.42	4.35	11.18	6.20	15.98	7.23	19.09	7.80	21.66	8.92	32.45	11.85	37.95
2000-1	329.4831384	1167.923	1.23	4.58	2.55	8.97	4.29	15.47	6.43	22.40	7.98	27.06	9.06	30.72	10.98	43.44	15.34	53.28
2005-6	324.494513	1492.418	1.18	5.76	2.34	11.31	4.19	19.66	6.81	29.21	8.59	35.65	10.32	41.04	13.19	56.63	16.14	69.42
2007-8	290.0689468	1782.487	1.10	6.86	2.09	13.40	3.62	23.28	5.46	34.67	6.77	42.42	7.99	49.03	10.12	66.75	13.32	82.74
2001-2	231.6467327	2014.133	0.70	7.56	1.23	14.63	2.14	25.42	3.44	38.11	4.61	47.03	5.86	54.89	8.53	75.28	13.68	96.42
2002-3	221.0422206	2235.176	0.94	8.50	1.88	16.51	3.11	28.53	4.37	42.48	5.15	52.18	5.75	60.64	6.50	81.78	7.12	103.55
2006-7	197.9038439	2433.079	0.70	9.20	1.42	17.93	2.71	31.24	4.25	46.74	5.60	57.78	6.90	67.53	9.81	91.59	15.02	118.56
2009-10	125.8626315	2558.942	0.39	9.59	0.95	18.87	1.91	33.15	3.26	49.99	4.43	62.21	5.60	73.13	7.90	99.49	11.61	130.17
2004-5	74.81376602	2633.756	0.19	9.78	0.47	19.34	0.96	34.11	1.83	51.82	2.74	64.95	3.63	76.75	5.50	104.99	8.70	138.87

6.6.3 Status of water stores during previous period

Volumes of water within RP3 and RP7 have gradually increased throughout the last five years. The overall storage of water onsite has increased from 9,126 ML in October 2008 to 16,392 ML in June 2013. While the current inventory appears to be high compared to previous years, the reader is cautioned that the values for 2013 are as at June (to align with new reporting deadlines) and such values do not include the additional 3 months of evaporation as represented in the October figures.

Table 31 Historic retention pond volumes

Storage Structure	Historic Volumes (ML)					
	Oct-08	Oct-09	Jun-10	Oct-11	Oct-12	Jun-13
RP-1	234.5	392.9	568	396	396	997
RP-2	2.1	2.1	3.6	4	5.5	5.6
RP-3	6,754	8,300	8,171	8,805	10,350	11,024
RP-5	5.67	5.96	5.2	5.4	7.4	4.8
RP-7	2,130	2,230	2,200	4,145	3,439	4,360
Total (ML)	9,126	10,931	10,948	13,355	14,198	16,392
Total (%)	51%	61%	61%	75%	78%	90%

Figure 87 through Figure 91 depict the pond water levels over time for the past reporting period

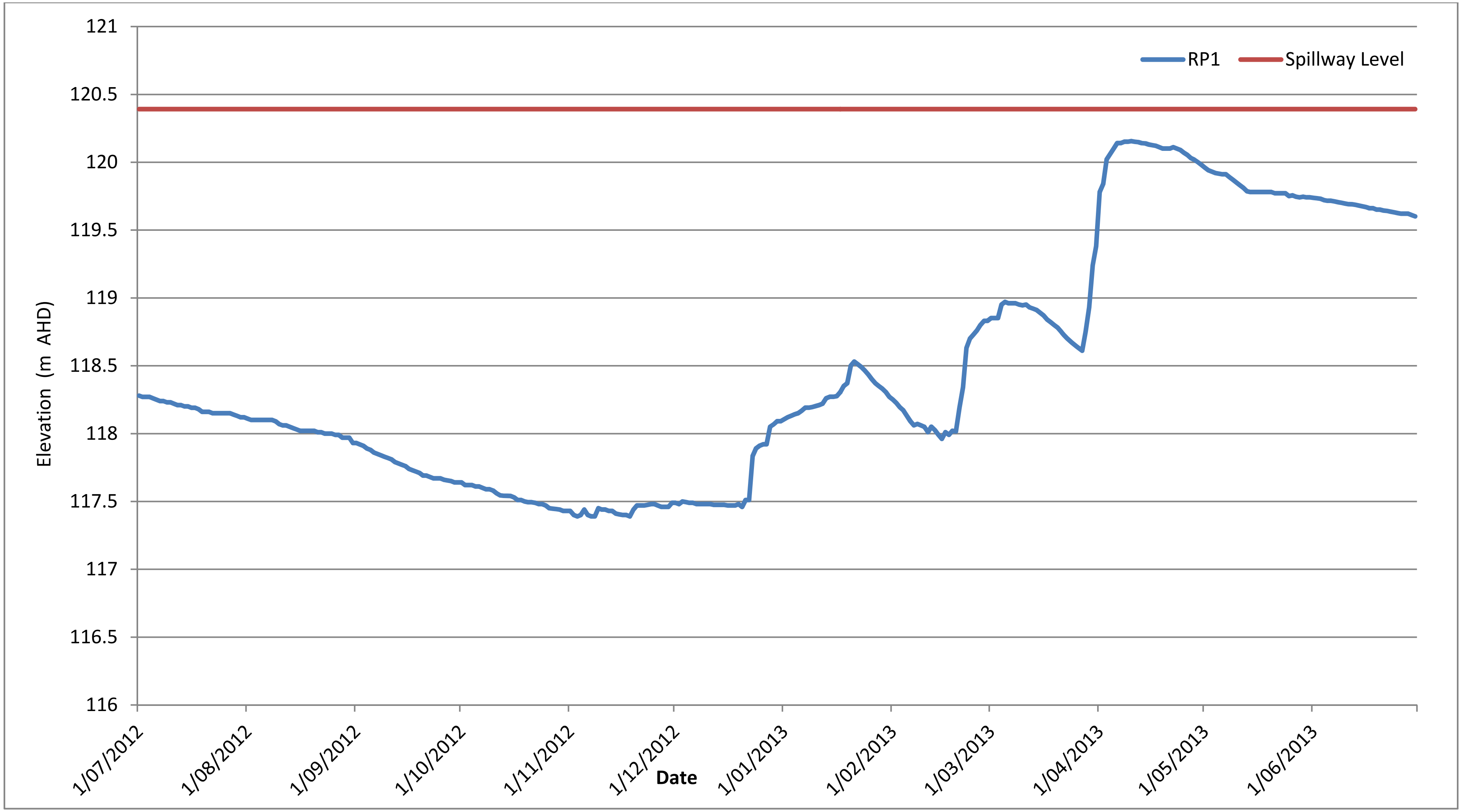

Figure 87 - RP1 Water level during 2012-13

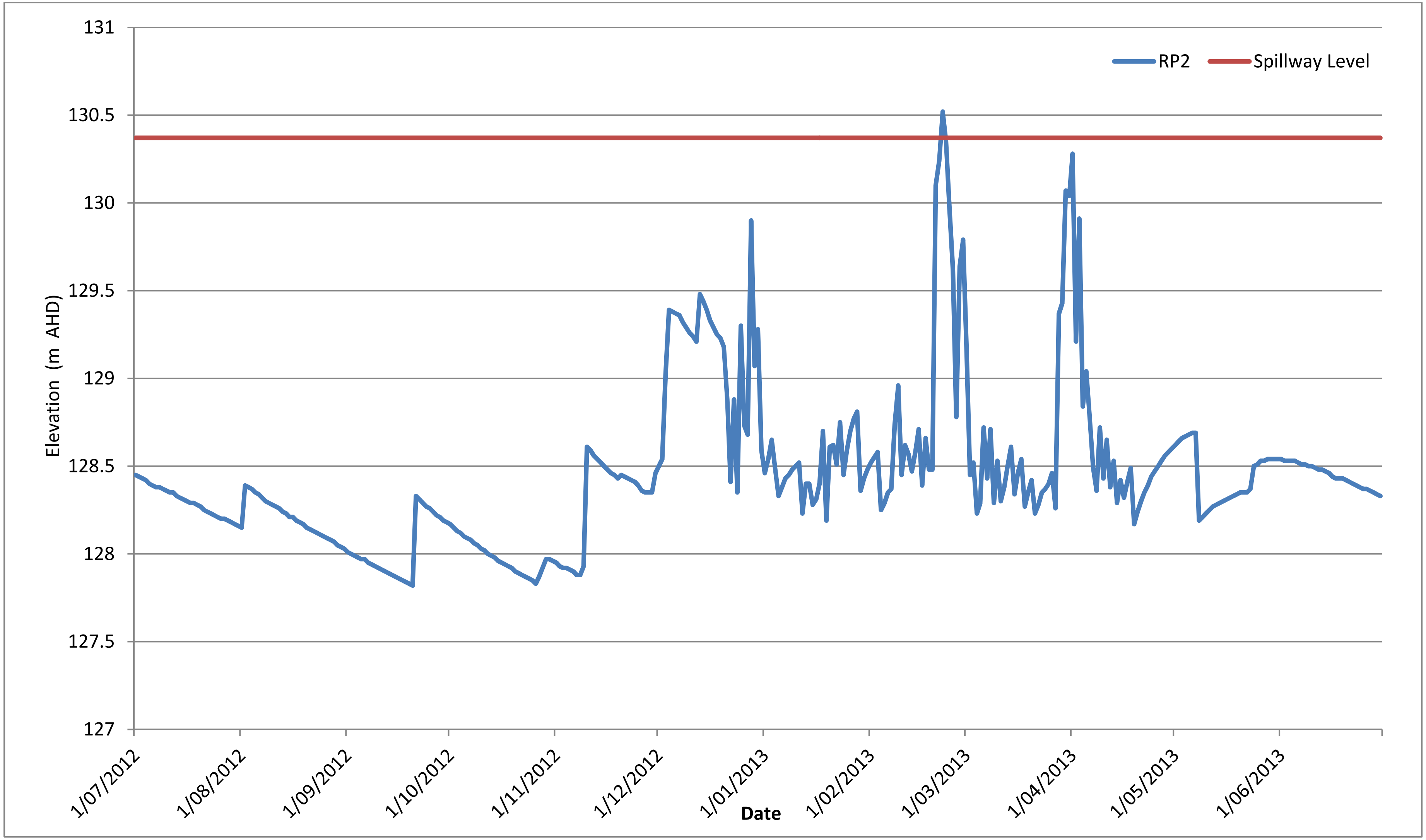

Figure 88 – RP2 Water level during 2012-13

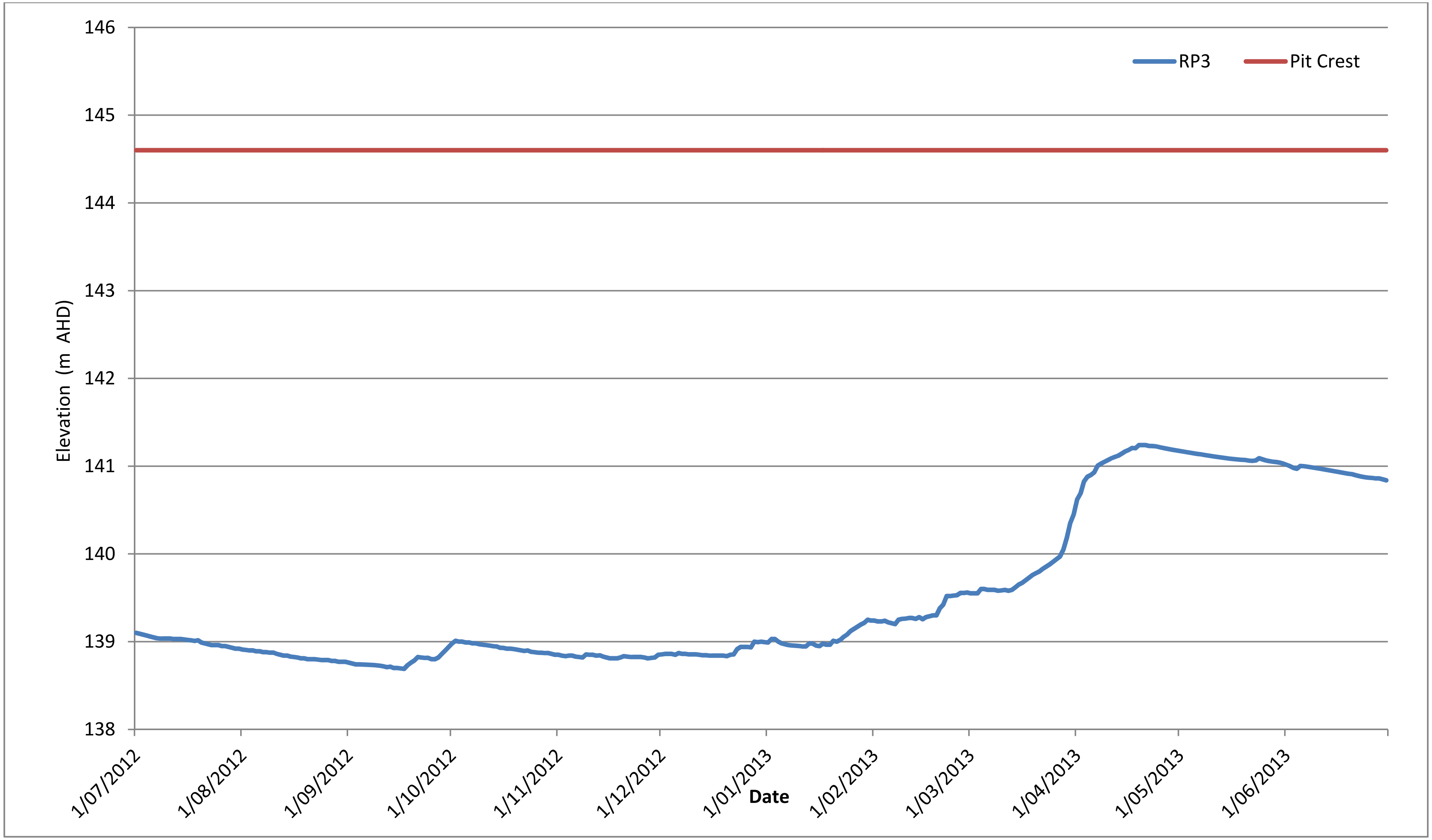

Figure 89 - RP3 Water level during 2012-13

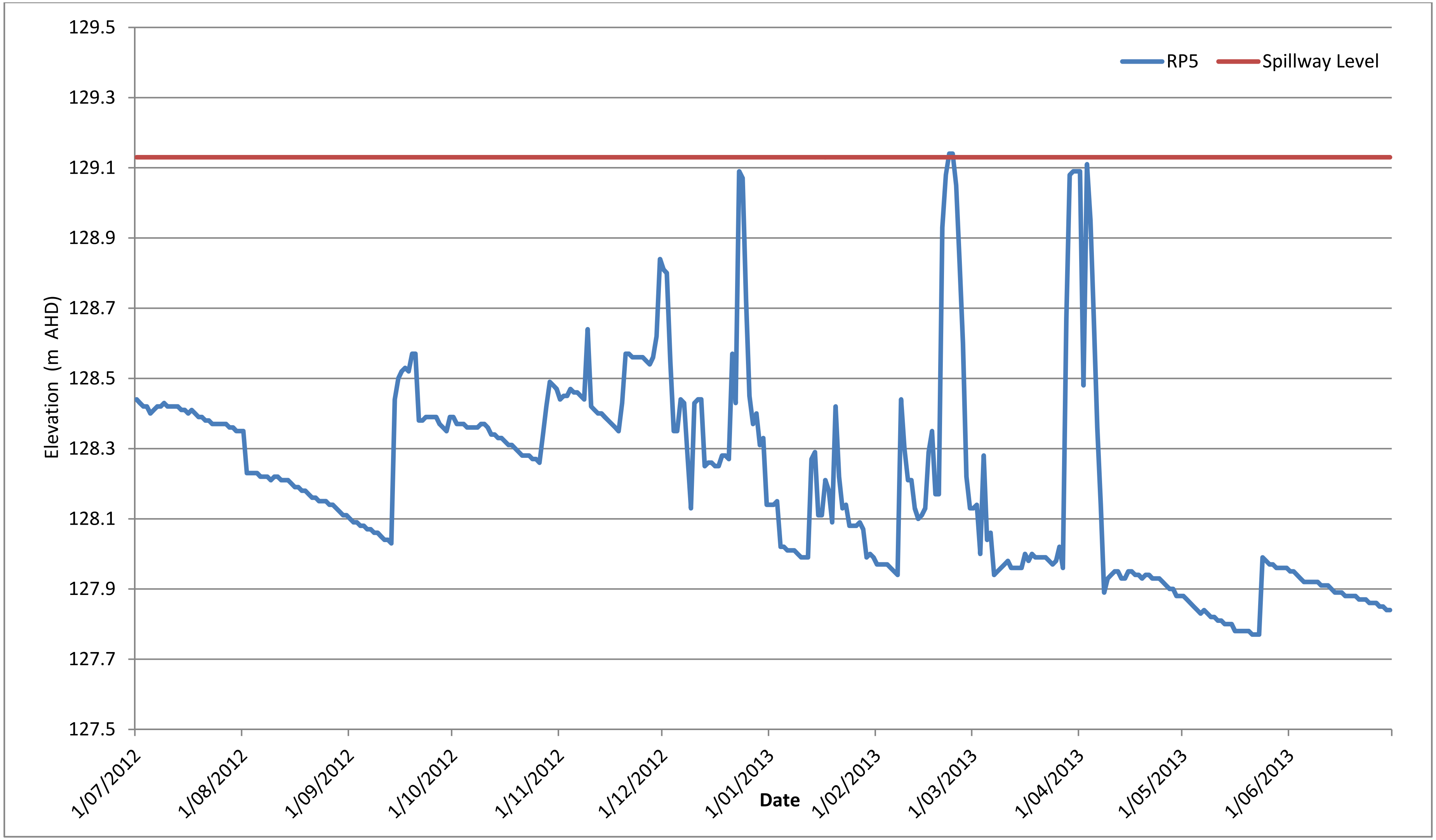

Figure 90 –RP5 Water level during 2012-13

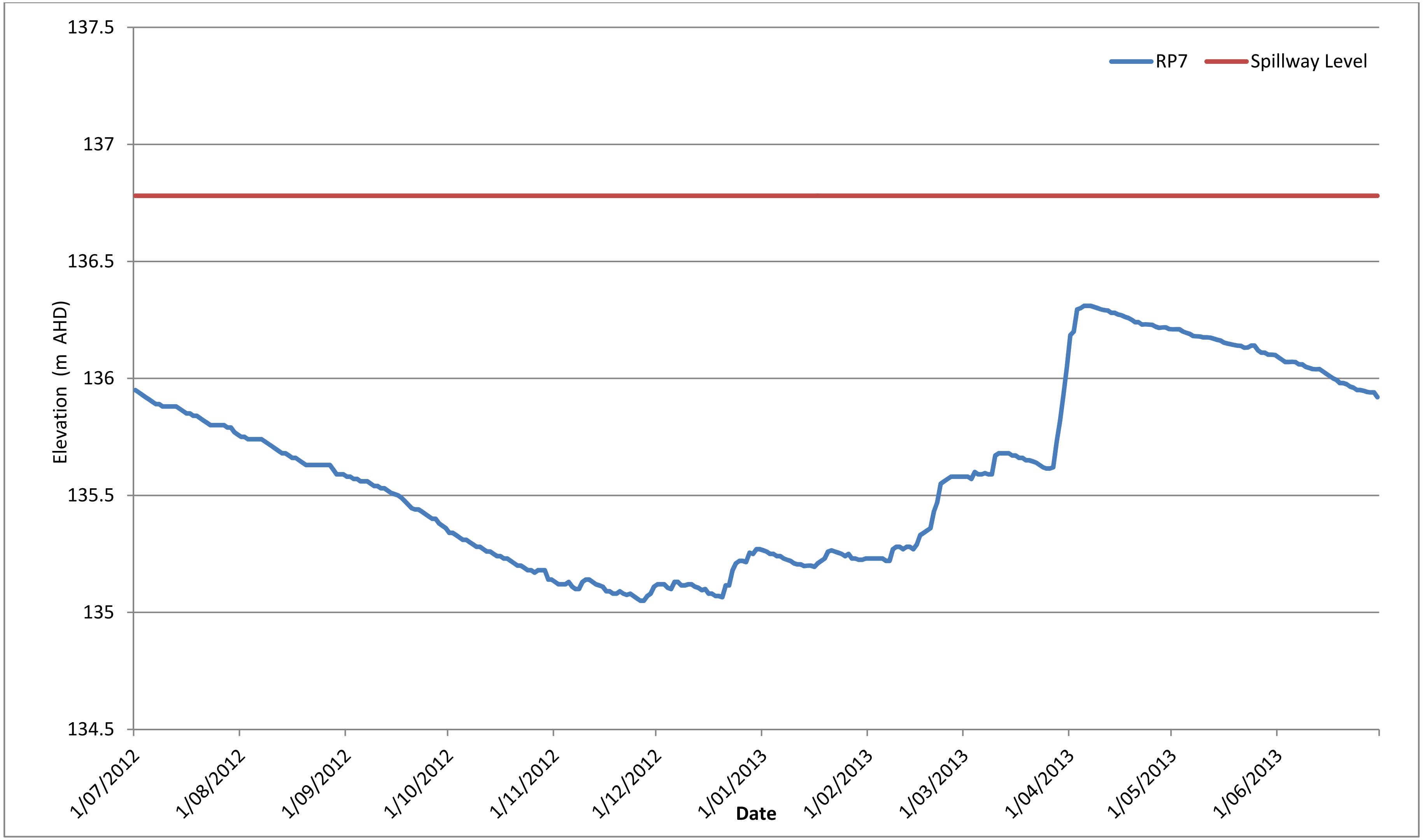

Figure 91 – RP7 Water level during 2012-13